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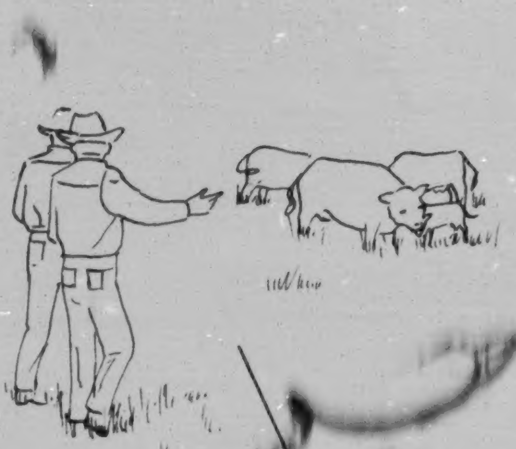
ABSTRACT

This curriculum guide in agricultural production is one of 10 guides developed as part of a vocational project stressing agribusiness, natural resources, and environmental protection. The scope of this guide includes four occupational subgroups: animal science, plant science, farm mechanics, and farm business management. It is meant as an aid to all who are involved in the curriculum planning phases prior to classroom instruction. Each unit has seven elements to be used for developing specific curriculum and curriculum materials: unit concept, student performance objectives, instructional areas, examples of learning activities, examples of evaluation processes, instructional materials or equipment, and references. Appendixes list recommended materials and equipment, additional references, and selected professional and technical societies. (Author/JC)



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Career Preparation in

AGRICULTURAL PRODUCTION

A Curriculum Guide

for High School Vocational Agriculture

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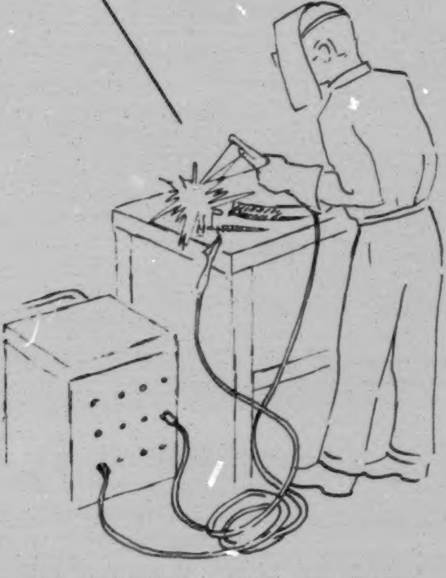

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BY

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1974

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FOREWORD

THIS SUGGESTED CURRICULUM GUIDE IN AGRICULTURAL PRODUCTION IS ONE OF TEN GUIDES DEVELOPED UNDER THE DIRECTION OF THE OHIO CAREER EDUCATION AND CURRICULUM MANAGEMENT LABORATORY, DEPARTMENT OF AGRICULTURAL EDUCATION, COLLEGE OF AGRICULTURE, THE OHIO STATE UNIVERSITY, AS A PART OF THE PROJECT ENTITLED "CURRICULUM DEVELOPMENT BASIC TO THE TRAINING TO INDIVIDUALS FOR EMPLOYMENT IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION." THE PROJECT WAS FUNDED UNDER A CONTRACT WITH THE BUREAU OF OCCUPATIONAL AND ADULT EDUCATION, U.S. OFFICE OF EDUCATION.

THE PROJECT GREW OUT OF THE NEED TO IDENTIFY THE EDUCATIONAL EXPERIENCES MOST APPROPRIATE FOR CAREER DEVELOPMENT IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION. EDUCATORS WERE LACKING ADEQUATE AND ACCURATE INFORMATION FOR THE CAREER AWARENESS AND EXPLORATION STAGES OF THE CAREER DEVELOPMENT PROCESS CONCERNING THE AGRIBUSINESS COMPLEX. THE AGRIBUSINESS COMPLEX ALSO HAD SEVERAL EMERGING PROGRAM AREAS WHERE OCCUPATIONAL COMPETENCIES AND THE RELATED CURRICULUM HAD NOT BEEN WELL DEFINED AT THE VOCATIONAL PREPARATION LEVEL. THESE CONDITIONS CAUSED APPROPRIATE CAREER DEVELOPMENT PROGRAMS TO BE LACKING OR INEFFECTIVE AT ALL LEVELS, INCLUDING VOCATIONAL EDUCATION.

IN MAY OF 1971, AGRICULTURAL LEADERS REPRESENTING STATE SUPERVISORS, TEACHER EDUCATORS, CLASSROOM TEACHERS AND THE AGRICULTURAL BUSINESS AND INDUSTRIAL COMMUNITY MET IN DENVER, COLORADO, TO DISCUSS THE CHANGING NATURE OF THE FIELD. THERE WAS GENERAL AGREEMENT THAT THE DEVELOPING EMPHASIS ON AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CALLED FOR MAJOR CURRICULUM CHANGES AND DEVELOPMENT OF NEW CURRICULA, WITH CHANGES IN THE PREPARATION OF AGRICULTURAL EDUCATION PERSONNEL AT THE SAME TIME.

THE PURPOSES OF THIS PROJECT WERE: (1) TO DEVELOP APPROPRIATE CURRICULUM GUIDES IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION WHICH PROVIDE A COORDINATED EDUCATIONAL PROGRAM, INCLUDING CAREER AWARENESS, CAREER EXPLORATION AND PREPARATION FOR A CLUSTER OF OCCUPATIONS; (2) TO ACQUAINT EDUCATIONAL LEADERSHIP IN ALL STATES WITH THE CURRICULUM MATERIALS FROM THIS PROJECT AND PROMOTE THEIR USE; AND (3) TO DISSEMINATE COPIES OF THE CURRICULUM MATERIALS TO LEADERS OF EACH STATE.

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AGRICULTURAL PRODUCTION

THE USE OF THIS CURRICULUM GUIDE

THERE IS LESS THAN FULL AGREEMENT ON JUST WHAT CONSTITUTES A PARTICULAR TYPE OF CURRICULUM DOCUMENT. THE CURRICULUM GUIDE IS NO EXCEPTION. THE FOLLOWING IS NOT MEANT AS AN EFFORT TO DEBATE CURRICULUM TERMINOLOGY FURTHER, BUT RATHER TO CLARIFY HOW THIS DOCUMENT CAN BE USED MORE EFFECTIVELY FOR ITS INTENDED PURPOSE.

ENTITLED A CURRICULUM GUIDE, IT IS DESIGNED TO ANSWER THE MORE BASIC QUESTIONS OF CURRICULUM PLANNING AND DEVELOPMENT - WHAT SHOULD BE TAUGHT AND, TO SOME DEGREE, HOW AND WITH WHAT RESOURCES. IT IS NOT INTENDED TO BE TAUGHT FROM NOR TO BE USED AS INSTRUCTIONAL MATERIAL IN THE CLASSROOM BY EITHER TEACHER OR STUDENTS.

IT IS MEANT AS AN AID TO ALL WHO ARE INVOLVED IN THE CURRICULUM PLANNING PHASES PRIOR TO CLASSROOM INSTRUCTION. FOR ADMINISTRATORS AND OTHERS WHO MUST MAKE DECISIONS CONCERNING FACILITIES OR EQUIPMENT, SPECIFICATIONS FOR FACILITIES AND EQUIPMENT LISTS ARE INCLUDED IN THE GUIDE. FOR GUIDANCE COUNSELORS OR OTHERS WORKING WITH STUDENTS ON CAREER DECISIONS, INFORMATION IS PROVIDED CONCERNING OCCUPATIONS AND THE TYPES OF COMPETENCIES AND CHARACTERISTICS NEEDED BY THE WORKERS FOR THESE OCCUPATIONS. FOR THE CURRICULUM SPECIALIST, TEACHER EDUCATOR, STATE SUPERVISOR OR OTHERS RESPONSIBLE FOR DETERMINING INSTRUCTIONAL CONTENT AND PREPARING TEACHERS TO CONDUCT INSTRUCTIONAL PROGRAMS, THE GUIDE DEFINES THE NEEDS OF THE STUDENTS IN TERMS OF TERMINAL PERFORMANCES. ALL OTHER ASPECTS OF CURRICULUM CONTENT, TEACHING PROCESSES AND INSTRUCTIONAL RESOURCES ARE BASED UPON THE TERMINAL PERFORMANCE OBJECTIVES FOR THE STUDENTS.

THE SCOPE OF THE GUIDE INCLUDES FOUR OCCUPATIONAL SUBGROUPS WITHIN THE AGRICULTURAL PRODUCTION AREA. THESE ARE CONSISTENT WITH AND CODED AS DEFINED IN THE STANDARD TERMINOLOGY FOR CURRICULUM AND INSTRUCTION IN LOCAL AND STATE SCHOOL SYSTEMS. THE OVERALL AREA OF AGRICULTURAL PRODUCTION IS GIVEN THE DESIGNATION 01.01 00 00 00. THE OCCUPATIONAL SUBGROUPS HAVE THE FOLLOWING DESIGNATIONS:

ANIMAL SCIENCE	01.01 01 00 00
PLANT SCIENCE	01.01 02 00 00
FARM MECHANICS	01.01 03 00 00
FARM BUSINESS MANAGEMENT	01.01 04 00 00

THE OCCUPATIONS CONSIDERED IN THESE FOUR SUBGROUPS ARE LIMITED TO THOSE ON THE CAREER LADDER FOR WHICH HIGH SCHOOL VOCATIONAL INSTRUCTION IS EITHER NECESSARY OR SIGNIFICANTLY DESIRABLE. THE UNITS WITHIN THE GUIDES ARE BUILT UPON MINIMUM LEVELS OF COMPETENCIES FOR ENTRY LEVEL JOBS. HOWEVER, IT IS ASSUMED THAT, EVEN THOUGH STUDENTS MUST BEGIN AT THIS ENTRY LEVEL JOB, MANY WILL SOON BE STRIVING TO ADVANCE. WHENEVER THE EMPLOYEE IS PRESENTED WITH OTHER DESIRABLE JOB OPPORTUNITIES, IT IS INTENDED THAT HIS VOCATIONAL INSTRUCTION WILL HELP HIM MASTER EARLY JOB OPPORTUNITY ADVANCES IN AN EFFICIENT MANNER.

SOME STATES HAVE PROVIDED THAT APPROXIMATELY 2,000 HOURS BE USED DURING THE JUNIOR AND SENIOR YEARS FOR INSTRUCTION, LABORATORY AND COOPERATIVE ON-THE-JOB EXPERIENCE IN A SPECIALIZED AGRICULTURAL PRODUCTION PROGRAM. WHILE THIS GUIDE MAY NOT COVER ALL POSSIBLE INSTRUCTIONAL SEQUENCES, THERE IS LIKELY TO BE MORE INCLUDED IN THIS GUIDE THAN WOULD BE USED IN ANY ONE PROGRAM INVOLVING 2,000 HOURS. IT IS INTENDED THAT THE USERS OF THIS GUIDE WILL SELECT THOSE INSTRUCTIONAL AREAS TO BUILD AN INSTRUCTIONAL PACKAGE WHICH MOST APPROPRIATELY MEETS THE STUDENTS' NEEDS IN THAT STATE OR LOCALITY.

BECAUSE MANY AGRICULTURAL PRODUCTION PROGRAMS ACROSS THE COUNTRY ARE SIMILAR OR, AT LEAST HAVE MANY COMMON AREAS IN THE CURRICULUM, CONSIDERABLE REDUNDANCY OF EFFORT OCCURS AS THESE PROGRAMS ARE PLANNED AND DEVELOPED. IN PREPARING THIS GUIDE, A MAJOR CONCERN HAS BEEN TO IDENTIFY THOSE PERFORMANCE OBJECTIVES WHICH ARE COMMON TO ALL OR TO A LARGE PROPORTION OF THE PROGRAMS. THOSE WHICH ARE ONLY APPROPRIATE TO LIMITED LOCALITIES HAVE NOT BEEN INCLUDED.

IT IS INTENDED THAT THE OBJECTIVES STATED IN THIS GUIDE WOULD SAVE TIME AND EFFORT FOR STATE PERSONNEL WHO HAVE THE RESPONSIBILITY FOR DEFINING THE OCCUPATIONAL COMPETENCIES IN AGRICULTURAL PRODUCTION.

ONCE THE OBJECTIVES FROM THE GUIDE WHICH ARE COMMON TO THE STATE CURRICULUM NEEDS ARE DEFINED, THEY COULD BE USED TO FACILITATE STATING MORE SPECIFIC LEVELS OF OBJECTIVES. OR, IF OTHER OBJECTIVES ARE MORE APPROPRIATE, THEY COULD BE SUBSTITUTED FOR THOSE PRESENTED AS STATE OR LOCAL CONDITIONS WARRANTED.

ORGANIZATION OF INSTRUCTIONAL UNITS

THIS CURRICULUM GUIDE IS COMPOSED OF UNITS OF INSTRUCTION. EACH UNIT IS DEVELOPED AROUND A CLOSELY REALTED GROUP OF PERFORMANCE OBJECTIVES WHICH ARE BASIC TO THE TRAINING OF INDIVIDUALS FOR ENTRY LEVEL SKILLED EMPLOYMENT IN AGRICULTURAL PRODUCTION OCCUPATIONS. THE UNITS ARE ORGANIZED INTO FOUR AGRICULTURAL PRODUCTION OCCUPATIONAL AREAS OF ANIMAL SCIENCE, PLANT SCIENCE, FARM MECHANICS, AND FARM BUSINESS MANAGEMENT.

THE INSTRUCTIONAL UNITS ARE BASED UPON THE COMPETENCIES OF ENTRY LEVEL SKILLED OCCUPATIONS IN AGRICULTURAL PRODUCTION. MOST OF THE PERFORMANCE OBJECTIVES FOR THE UNITS ARE COMMON TO AGRICULTURAL PRODUCTION PROGRAMS.

FORMAT OF THE UNITS OF INSTRUCTION

EACH OF THE UNITS OF INSTRUCTION HAS SEVEN ELEMENTS TO BE USED FOR DEVELOPING SPECIFIC CURRICULUM AND CURRICULUM MATERIALS. THE LIST OF ELEMENTS INCLUDES:

1. UNIT CONCEPT
2. STUDENT PERFORMANCE OBJECTIVES
3. INSTRUCTIONAL AREAS
4. EXAMPLES OF STUDENT LEARNING ACTIVITIES
5. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE
6. INSTRUCTIONAL MATERIALS OR EQUIPMENT
7. EXAMPLES OF SUPPORTING REFERENCES

A DESCRIPTION OF THE SEVEN ELEMENTS OF THE UNITS OF INSTRUCTION

UNIT CONCEPT

THE UNIT CONCEPT DEFINES THE RATIONALE FOR THE AREA COVERED BY THE INSTRUCTIONAL UNIT.

STUDENT PERFORMANCE OBJECTIVES

THE STUDENT PERFORMANCE OBJECTIVES HAVE BEEN CONSIDERED THE BASIC ELEMENT OF THE UNITS OF INSTRUCTION. ALL OTHER ELEMENTS ARE DEVELOPED FROM THE PERFORMANCE OBJECTIVES. THE OBJECTIVES ARE STATED IN STUDENT TERMS AT A TERMINAL PEFFORMANCE LEVEL. THE TERMINAL PERFORMANCES HAVE BEEN DEFINED FROM AN ANALYSIS OF COMPETENCIES NECESSARY FOR SUCCESSFUL PERFORMANCE IN THE ENTRY LEVEL SKILLED OCCUPATIONS OF AGRICULTURAL PRODUCTION.

THE PERFORMANCE OBJECTIVES OF THE GUIDE ARE INTENDED TO AID CURRICULUM SPECIALISTS AND TEACHERS OF LOCAL AGRICULTURAL PRODUCTION PROGRAMS IN DEFINING THE COMPETENCIES WHICH CAN AND SHOULD BE ACQUIRED BY STUDENTS IN LOCAL PROGRAMS.

IT WAS FELT THAT COMPETENT TEACHERS OF A VOCATIONAL PROGRAM WOULD BE IN THE BEST POSITION TO ESTABLISH "HOW WELL" THE OBJECTIVE SHOULD BE PERFORMED, AND THE CONDITIONS UNDER WHICH IT SHOULD BE PERFORMED. HOWEVER, CONDITIONS AND STANDARDS HAVE BEEN INDICATED FOR MOST OBJECTIVES. THE INTENT IS TO DIRECT ATTENTION TO THOSE CONDITIONS WHICH MAY SIGNIFICANTLY AFFECT ACHIEVING THE PERFORMANCE AND IDENTIFY STANDARDS WHICH MAY BE ESPECIALLY IMPORTANT TO SUCCESS IN THE INDUSTRY.

INSTRUCTIONAL AREAS

THE PERFORMANCE OBJECTIVES ARE DESCRIPTIONS OF INTENDED OUTCOMES WHICH REQUIRE THE ACQUISITON OF CERTAIN KNOWLEDGE AND SKILLS. TITLES AND SUBTITLES OF INSTRUCTIONAL AREAS ARE USED TO DEFINE THE RELEVANT CONTENT.

THE TITLES ARE PRESENTED IN AN ACTION FORM AS FAR AS FEASIBLE TO HELP TO DEFINE THE SPECIFIC TYPE OF LEARNING EXPECTED TO ACHIEVE THE OBJECTIVES. THAT IS, IN DEFINING STUDY AREAS CONCERNING ANIMAL HEALTH, RATHER THAN LIMITING THE TITLE BY USING "ANIMAL HEALTH," THE STUDY AREAS OF "DETECTING AND CONTROLLING ANIMAL PARASITES" AND "DETECTING AND CONTROLLING COMMON LIVESTOCK DISEASES" ARE USED. THE GERUND VERB FORM OR "-ING" FORM OF THE TITLE IS TO AID IN MORE SPECIFICALLY DEFINING THE COMPETENCIES TO BE BROUGHT OUT IN THE LEARNING PROCESSES.

BECAUSE OF THE SPECIFIC NATURE OF MUCH OF THE LEARNING MATERIALS NEEDED FOR THESE INSTRUCTIONAL AREAS, REFERENCES ARE CITED WHICH WOULD BE APPROPRIATE FOR CURRICULUM DEVELOPERS. THE TITLES FOR THE INSTRUCTIONAL AREAS ARE OF A RELATIVELY PERMANENT NATURE AND COMMON TO MOST PROGRAMS. THE SPECIFIC CONTENT TO SUPPORT THEM IS MUCH MORE ADVERSELY AFFECTED BY CHANGES IN TECHNOLOGY, GEOGRAPHICAL DIFFERENCES OR DIFFERENCES IN LOCAL OCCUPATIONAL CHARACTERISTICS.

IT MAY BE POSSIBLE TO USE THE SUGGESTED TITLES OVER A PERIOD OF TIME WITH RELATIVELY MINOR ADJUSTMENTS. SPECIFIC CONTENT, ON THE OTHER HAND, NEEDS TO BE CONTINUALLY UPDATED TO CURRENT CONDITIONS AND MATCHED WITH LOCAL STUDENT NEEDS AND OCCUPATIONAL CHARACTERISTICS.

THE NUMBERS OF THE INSTRUCTIONAL AREA TITLES ARE NOT MATCHED TO THE NUMBERS OF THE STUDENT PERFORMANCE OBJECTIVES. HOWEVER, INSTRUCTIONAL AREAS RELATING TO AN OBJECTIVE CAN BE DETERMINED RELATIVELY EASILY. THE INSTRUCTIONAL AREAS ARE SEQUENCED AS MUCH AS IS FEASIBLE IN THE SAME ORDER AS THE PERFORMANCE OBJECTIVES TO WHICH THEY RELATE.

EXAMPLES OF STUDENT LEARNING ACTIVITIES

EXAMPLES ARE PROVIDED SUGGESTING WAYS IN WHICH STUDENTS MAY BE ACTIVELY INVOLVED IN LEARNING ACTIVITIES THAT WOULD HELP THEM ACHIEVE THE OBJECTIVES. THEY ARE OFFERED AS ONE APPROACH THAT MAY BE USED RATHER THAN INTENDED TO BE THE COMPLETE LIST OF ACTIVITIES WHICH WOULD PROVIDE THE MOST EFFECTIVE LEARNING. THE SUGGESTED ACTIVITIES FOR EACH OBJECTIVE MAY OR MAY NOT COVER THE ENTIRE OBJECTIVE. THEREFORE, DEVELOPMENT OF OTHER ACTIVITIES FOR THE LOCAL PROGRAM WILL BE NECESSARY FOR A COMPREHENSIVE PROGRAM.

THERE IS AT LEAST ONE ACTIVITY FOR EACH STUDENT PERFORMANCE OBJECTIVE. THE NUMBER ON THE ACTIVITY IS THE SAME AS THE STUDENT PERFORMANCE OBJECTIVE TO WHICH IT IS RELATED.

EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

THE STUDENT EVALUATION SHOULD BE DIRECTED TOWARD AND BASED UPON WELL-WRITTEN STUDENT PERFORMANCE OBJECTIVES. IN THIS GUIDE, THE STUDENT PERFORMANCE OBJECTIVES ARE INTENDED TO BE EXPLICITLY STATED IN WHAT TERMINAL PERFORMANCE THE STUDENT IS TO BE ABLE TO DO AND, TO SOME DEGREE, HOW WELL AND UNDER WHAT CONDITIONS. PRIMARILY, THE EVALUATION IS TO USE THE STATED OBJECTIVES AS A REFERENCE POINT TO ANSWER THE QUESTION - CAN THE STUDENT ACHIEVE THE DESIRED PERFORMANCE LEVEL.

IN ADDITION, AN ELEMENT DESIGNATED AS "EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE" IS INCLUDED IN EACH UNIT OF INSTRUCTION. EXAMPLES OF EVALUATION PROCESSES ARE INTENDED TO ASSIST IN DETERMINING THE LEVEL OF UNDERSTANDING OF THE ABILITY OF THE STUDENT TO ACCOMPLISH PARTS OF OR THE ENTIRE PERFORMANCE OBJECTIVE. THESE PROCESSES ARE NOT INTENDED TO REPLACE A DIRECT EVALUATION OF THE TERMINAL PERFORMANCE AS STATED IN THE OBJECTIVE.

THE TYPE OF EVALUATION PROCESS IS DETERMINED IN PART BY THE NATURE OF THE PERFORMANCE OBJECTIVES. BUT THE MOST DESIRABLE METHOD CAN BE BEST DETERMINED WHEN THERE IS KNOWLEDGE OF THE LOCAL SITUATION, SUCH AS EDUCATIONAL RESOURCES, SCHOOL POLICIES AND THE NEEDS OF THE STUDENTS.

THERE IS AT LEAST ONE EVALUATION PROCESS FOR EACH STUDENT PERFORMANCE OBJECTIVE. THE NUMBER ON THE EVALUATION ACTIVITY IS THE SAME AS THE STUDENT PERFORMANCE OBJECTIVE TO WHICH IT IS RELATED.

INSTRUCTIONAL MATERIALS OR EQUIPMENT

MATERIALS OR EQUIPMENT ARE NOTED WHICH ARE SPECIFIC TO THE UNIT AND WHICH ARE CONSIDERED ESSENTIAL OR QUITE DESIRABLE IN THE LEARNING PROCESS. IN SOME CASES, THE OBJECTIVES WOULD BE QUITE DIFFICULT TO ACHIEVE, IF AT ALL, WITHOUT THE MATERIALS. IN OTHERS, THE MATERIALS OR EQUIPMENT AID IN THE EFFECTIVENESS OR EFFICIENCY OF LEARNING.

THE MATERIALS AND EQUIPMENT SUGGESTED FOR ONE UNIT ARE NOT NECESSARILY CONSUMED OR UNIQUE JUST TO THE LEARNING ACTIVITIES OF THAT UNIT. A LIST OF THE EQUIPMENT SUGGESTED FOR A COMPREHENSIVE AGRICULTURAL PRODUCTION PROGRAM IS LISTED IN APPENDIX A.

EXAMPLES OF SUPPORTING REFERENCES

A LIMITED NUMBER OF REFERENCES HAS BEEN LISTED WHICH DIRECTLY RELATES TO THE CURRICULUM STUDY AREAS SUGGESTED IN THE "INSTRUCTIONAL AREAS" SECTION. THESE REFERENCES ARE AVAILABLE AND THE SOURCES OR DETAILS OF SECURING THEM ARE LOCATED IN APPENDIX B OF THIS GUIDE.

WHEN TWO OR MORE REFERENCES ARE FOUND TO HAVE ADEQUATE LEARNING MATERIALS AND PROCESSES FOR THE OBJECTIVES OF A UNIT BUT HAVE UNIQUELY DIFFERENT STYLES, THE GROUP MAY BE LISTED SO THAT THE TEACHER HAS THE CHOICE OF SELECTING THE ONE MOST SUITED TO HIS TEACHING.

IN SOME CASES, SEVERAL REFERENCES ARE NOTED BECAUSE NO ONE REFERENCE ADEQUATELY COVERS ALL OF THE OBJECTIVES OF A UNIT OR STUDY AREA. ANNOTATIONS OF THE REFERENCES ARE PROVIDED TO AID IN DETERMINING WHICH REFERENCE OR REFERENCES WOULD BE BEST SUITED FOR A LOCAL PROGRAM. THE REFERENCE SUGGESTED FOR ONE UNIT IS OFTEN RELEVANT TO AND SUGGESTED FOR USE IN SEVERAL OF THE UNITS. IN NO WAY SHOULD THE REFERENCES BE CONSIDERED THE BEST OR ONLY REFERENCES TO BE USED WITH THE UNITS.

RECOMMENDED FACILITIES AND EQUIPMENT

SUGGESTIONS FOR PLANNING THE FACILITIES FOR AGRICULTURAL PRODUCTION PROGRAMS

THE NATURE AND THE EXTENT OF THE FACILITIES NEEDED FOR AGRICULTURAL PRODUCTION INSTRUCTION WILL BE INFLUENCED BY THE PROJECTED ENROLLMENTS AND PLANNED USE OF THE FACILITIES BY CONTINUING EDUCATION AND OTHER GROUPS, AND THE EMPHASES TO BE INCLUDED IN THE COURSE OF STUDY. THE SUGGESTIONS WHICH FOLLOW ARE TO BE CONSIDERED ONLY AS GUIDES FOR SCHOOL FACILITY PLANNERS AND ARCHITECTS.

SPACE ALLOCATIONS

RECOMMENDED MINIMUM SPACE ALLOCATIONS FOR ACCOMMODATING TWENTY STUDENTS PER SECTION INCLUDE:

CLASSROOM - 750 SQUARE FEET
SHOP AND LABORATORY - 2,000 SQUARE FEET
LAND LABORATORY - ACCESS TO ABOUT 5 ACRES

THE CLASSROOM

THE CLASSROOM SHOULD BE EQUIPPED WITH TABLES AND CHAIRS TO ACCOMMODATE 25 STUDENTS, A TACK BOARD, A CHALK BOARD, A TEACHER'S WORK BENCH AND SINK AND OFFICE EQUIPMENT, SUCH AS DESK, CHAIRS, WALL CABINET WITH LOCKS, BOOK SHELVES, AND FILING CABINETS.

CONSIDERATION SHOULD BE GIVEN TO PROVIDING COMBINATION STUDENT TABLES WITH EITHER A FULL OR PARTIAL TILTING TOP WHICH WILL PROVE USEFUL IN THE MECHANICAL DRAWING PHASES OF THE INSTRUCTIONAL PROGRAM.

ARTIFICIAL LIGHTING SHOULD PROVIDE A MINIMUM OF 75 FOOT CANDLES ON THE TABLE TOPS OF STUDENT WORK AREAS. CONVENIENT OUTLETS SHOULD BE INSTALLED ON EACH WALL. ADEQUATE STORAGE SPACE FOR EQUIPMENT, SUPPLIES, CHARTS, SPECIMENS, MODELS AND TROPHIES SHOULD BE PROVIDED IN CUPBOARDS AND DRAWERS. ENCLOSED STORAGE CABINETS ARE PREFERRED. A MINIMUM CABINET AREA WOULD BE 12' LONG, 8' HIGH AND 18" DEEP.

SHELVES AND CASES SHOULD BE CONSTRUCTED FOR BOOKS, REFERENCE MATERIALS, DEPARTMENT LIBRARY BULLETINS, MAGAZINES, OTHER PUBLICATIONS AND TEACHING MATERIALS. STORAGE SHOULD ALSO BE PROVIDED FOR STUDENT NOTEBOOKS, SUPPLIES AND EQUIPMENT. TWENTY STUDENTS MAY HAVE INDIVIDUAL STORAGE AREAS APPROXIMATELY 4" X 12" X 14".

THE SHOP AND LABORATORY

SUITABLE FACILITIES SHOULD BE PROVIDED SO THAT PUPILS WILL HAVE AN APPROPRIATE PLACE TO WORK AND STUDY IN THE AREAS OF FARM POWER AND MACHINERY, FARM BUILDINGS AND CONVENIENCES, SOIL AND WATER MANAGEMENT, RURAL ELECTRIFICATION AND PROCESSING, AND AGRICULTURAL CONSTRUCTION AND MAINTENANCE. ON OCCASION, THE SHOP IS USED FOR OTHER PROJECTS SUCH AS CASTRATING PIGS, DISSECTING VARIOUS ANIMAL OR PLANT PARTS, OR CONSTRUCTION OF LARGE DISPLAYS. THE LABORATORY AREA SHOULD HAVE A CONCRETE FLOOR, AT LEAST A 16' WIDE BY 14' HIGH OVERHEAD DOOR AND ADEQUATE LIGHTING, VENTILATION AND HEATING. IT ALSO SHOULD BE

PROVIDED WITH APPROPRIATE BENCHES, TOOL CABINETS AND/OR STORAGE AREA, SHOP EQUIPMENT, AND OTHER FURNITURE.

A CAREFUL CONSIDERATION OF THE SUGGESTED COURSE OF STUDY RELATED TO AGRICULTURAL MECHANICS AREA AND THE TOOL AND EQUIPMENT CHECK LISTS INCLUDED IN THIS PUBLICATION WILL PROVIDE ADDITIONAL GUIDELINES IN DEVELOPING PLANS FOR THE SHOP AND LABORATORY.

THE LAND LABORATORY

ACCESS SHOULD BE PROVIDED TO AT LEAST FIVE ACRES OF LAND FOR THE DEVELOPMENT OF THE FOLLOWING:

STUDENT DEMONSTRATION PLOTS
HOUSING, PENNING, OR PASTURING FARM LIVESTOCK
STUDENT PRACTICE PLOTS AND GARDENS

MANY SCHOOLS HAVE A FARM DONATED TO THEM OR ARE ABLE TO PURCHASE ONE WHICH MAY VARY IN SIZE. THIS, THEN IS OPERATED AS A SCHOOL FARM AND SUPPORTS THE TOTAL VOCATIONAL AGRICULTURE PROGRAM. WHEN LARGE FARMING OPERATIONS ARE PURCHASED OR DONATED, IT IS RECOMMENDED THAT A FULL-TIME MANAGER BE EMPLOYED TO OVERSEE THE TOTAL OPERATION. DUE TO THE EXTENSIVE DUTIES AND RESPONSIBILITIES EXPECTED OF VOCATIONAL AGRICULTURE TEACHERS, THEY SHOULD NOT BE EXPECTED TO ALSO ASSUME THE RESPONSIBILITY OF OPERATING AND MANAGING THE ENTIRE SCHOOL FARM.

IT IS DESIRABLE THAT THIS LABORATORY BE LOCATED AS CLOSE TO THE SCHOOL BUILDINGS AS POSSIBLE. IT SHOULD BE ESTABLISHED ON REASONABLY GOOD SOIL AND, IF POSSIBLE, PROTECTED BY FENCING.

OTHER ALTERNATIVES TO THE LAND LABORATORY COULD BE ACTUAL USE OF COOPERATING FARMER'S LAND, EQUIPMENT, AND ANIMALS. THIS IS AN EFFECTIVE AND ECONOMICAL PROCEDURE TO FOLLOW IN PROVIDING THE STUDENT WITH THE OPPORTUNITY TO PRACTICE WHAT IS LEARNED IN THE CLASSROOM. THE AVAILABILITY OF A SCHOOL BUS IS ESSENTIAL WHEN USING THIS PROCEDURE TO ITS BEST ADVANTAGE.

RECOMMENDED EQUIPMENT AND SUPPLIES

THE TYPE AND QUANTITIES OF EQUIPMENT AND SUPPLIES REQUIRED TO PROVIDE EFFECTIVE OCCUPATIONAL EDUCATION IN AGRICULTURAL PRODUCTION WILL DEPEND ON SEVERAL FACTORS. THESE INCLUDE: THE ANTICIPATED SIZES OF THE GROUPS TO BE SERVED, THE TYPES OF GROUPS TO BE SERVED SUCH AS SECONDARY OR ADULT, THE EMPHASIS TO BE INCLUDED IN THE COURSE OF STUDY IN TERMS OF THE DIVERSIFICATION OR SPECIALIZATION, AND OTHER FACTORS.

THE OPTIMUM CLASS SIZE IS CONSIDERED, FOR PLANNING PURPOSES, TO BE ABOUT 25 PUPILS. SUFFICIENT QUANTITIES OF TOOLS, EQUIPMENT AND SUPPLIES SHOULD BE PROVIDED TO MAKE MAXIMUM USE OF THE TIME AVAILABLE FOR LABORATORY AND PRACTICAL EXERCISES. THIS WILL NOT NECESSARILY REQUIRE THAT 25 DUPLICATES OF A SPECIFIC ITEM WILL BE NEEDED, AS PROPER MANAGEMENT OF PRACTICAL SITUATIONS WILL SELDOM RESULT IN EACH PUPIL USING THE IDENTICAL ITEM AT THE SAME TIME.

PROVISION SHOULD BE MADE, WHEN IT IS POSSIBLE TO DO SO, TO PURCHASE SEVERAL DIFFERENT BRANDS OF THE SAME ITEM. THIS WILL PROVIDE OPPORTUNITIES FOR PUPILS TO BECOME FAMILIAR WITH THE PRODUCTS OF COMPETING MANUFACTURERS, RATHER THAN JUST ONE.

AN ADVISORY COMMITTEE COMPOSED OF REPRESENTATIVES OF LOCAL SEGMENTS OF THE AGRICULTURAL PRODUCTION INDUSTRY PROVIDE INVALUABLE ASSISTANCE IN DEVELOPING LISTS OF NEEDED EQUIPMENT AND SUPPLIES.

BECAUSE INSTRUCTION IN AGRICULTURAL MECHANICS IS AN IMPORTANT COMPONENT OF THE TOTAL AGRICULTURAL PRODUCTION PROGRAM, IT WILL BE NECESSARY TO PROVIDE TOOLS AND EQUIPMENT TO OUTFIT THE MECHANICS LABORATORY. THE TYPES AND NUMBERS OF SUCH ITEMS TO BE PURCHASED WILL BE DEPENDENT UPON THEIR AVAILABILITY IN OTHER OCCUPATIONAL PROGRAMS AT THE SCHOOL OR AREA OCCUPATIONAL EDUCATION CENTER.

TEACHER REQUIREMENTS AND RESPONSIBILITIES

IN ORDER FOR AN AGRICULTURAL PRODUCTION CURRICULUM TO BE EFFECTIVE, THE TEACHING STAFF MUST BE COMPETENT AND ENTHUSIASTIC. THE SPECIALIZED NATURE OF THE CURRICULUM REQUIRES THAT THE TEACHER(S) HAVE COMPETENCIES IN PRODUCING, USING, AND MARKETING AGRICULTURAL PRODUCTS, GAINED THROUGH EXPERIENCE AND SPECIALIZED TRAINING IN AGRICULTURAL PRODUCTION.

THE TEACHER(S) SHOULD UNDERSTAND THE EDUCATIONAL PHILOSOPHY, THE OBJECTIVES AND THE SPECIFIC REQUIREMENTS OF THE PROGRAM. THEY WILL NEED TO BE ABLE TO ORGANIZE AND DEVELOP PROGRAMS FOR EACH INDIVIDUAL SO THAT HE MEETS THE REQUIREMENTS OF THE OCCUPATIONAL CLUSTER(S) THAT HE IS PREPARING TO ENTER.

TEACHERS SHOULD BE CERTIFIED ON THE BASIS OF COMPLETION OF A DEGREE IN AGRICULTURAL EDUCATION WITH SPECIALIZATION IN AGRICULTURAL PRODUCTION AND THIS CERTIFICATION SHOULD ALSO REQUIRE A PERIOD OF OCCUPATIONAL EXPERIENCE IN AGRICULTURAL PRODUCTION. RESPONSIBILITIES OF THE TEACHER(S) INCLUDES:

1. PLANNING A PROGRAM OF AGRICULTURAL PRODUCTION INCLUDING WORKING WITH ADVISORY COMMITTEES AND DEVELOPING A CURRICULUM TO FIT LOCAL NEEDS
2. TEACHING CLASSES
3. SUPERVISING OCCUPATIONAL EXPERIENCE PROGRAMS
4. SELECTING AND UTILIZING FACILITIES AND EQUIPMENT
5. ADVISING YOUTH ORGANIZATIONS
6. INFORMING THE PUBLIC OF PROGRAM, ACTIVITIES AND STUDENTS' RESOURCES
7. UTILIZING COMMUNITY RESOURCES
8. PROVIDING SAFETY INSTRUCTION AND PRACTICES
9. GUIDING AND COUNSELING STUDENTS
10. PLACEMENT AND FOLLOW-UP OF STUDENTS

MOTIVATION AND MORALE BUILDING SHOULD BE A PART OF EVERY CLASS AND LABORATORY PERIOD. IT IS SUGGESTED THAT THE INSTRUCTOR MAKE AN EFFORT EARLY IN THE PROGRAM TO ESTABLISH AN ENVIRONMENT WHICH WILL HEIGHTEN AND MAINTAIN THE STUDENT'S INTEREST. THE SUCCESS OF THE PROGRAM CAN BE JUDGED PRIMARILY BY THE NUMBER OF STUDENTS WHO REMAIN GAINFULLY EMPLOYED IN CAREERS WHICH WOULD OTHERWISE NOT HAVE BEEN AVAILABLE TO THEM.

ADVISORY COMMITTEES

ADVISORY COMMITTEES UTILIZING COMMUNITY RESOURCE PERSONS CAN ASSIST THE SECONDARY INSTITUTION ADMINISTRATION IN PLANNING AND IMPLEMENTING AGRICULTURAL PRODUCTION PROGRAMS TO MEET THE OBJECTIVES OF THE INSTITUTION, THE STUDENT AND THE COMMUNITY.

THE SPECIAL ADVISORY COMMITTEE FOR THE AGRICULTURAL PRODUCTION OCCUPATIONAL PROGRAMS SHOULD INCLUDE REPRESENTATIVES OF EMPLOYERS AND PUBLIC EMPLOYMENT SERVICES, SCIENTIFIC OR TECHNICAL SOCIETIES AND ASSOCIATIONS IN THE FIELD AND KNOWLEDGEABLE CIVIC LEADERS WHO MEET WITH AND ADVISE THE SPECIALISTS ON THE SCHOOL STAFF. THE COMMITTEE NORMALLY CONSISTS OF ABOUT NINE TO TWELVE MEMBERS WHO GENERALLY SERVE FOR A ONE- TO THREE-YEAR PERIOD. THE HEAD OF THE INSITITUION OR THE DEPARTMENT HEAD IS ORDINARILY CHAIRMAN. MEMBERS ARE APPOINTED FOR REGULAR TERMS, SUBJECT TO REAPPOINTMENT, AND MEMBERSHIP SHOULD ROTATE SO THAT SOME EXPERIENCED ADVISORS ARE PRESENT WITH SOME NEW ONES EACH TERM. IT

SHOULD BE REMEMBERED THAT ADVISORY COMMITTEE PEOPLE ARE BUSY; THEREFORE, MEETINGS SHOULD BE CALLED ONLY WHEN COMMITTEE ACTION CAN BEST HANDLE A SPECIFIC TASK OR PROBLEM.

LETTERS OF APPOINTMENT SHOULD COME FROM THE CHIEF SCHOOL ADMINISTRATOR. WHILE THE COMMITTEE FUNCTIONS WITHOUT LEGAL STATUS OR POWERS, IT CAN PROVIDE INVALUABLE ASSISTANCE TO THE INSTITUTION BY ASSISTING IN A FEASIBILITY STUDY OF PROPOSED NEW EDUCATIONAL PROGRAMS BY PROVIDING SUPPORT TO SCHOOL ADMINISTRATORS IN OBTAINING APPROPRIATIONS AND STATE AND FEDERAL SUPPORT TO FINANCE THE PROGRAMS BY ASSISTING IN THE LOCATION OF WORK EXPERIENCE STATIONS, BY SURVEYING AND DEFINING THE KNOWLEDGE AND SKILLS NEEDED BY AGRICULTURAL PRODUCTIONS WORKERS AND BY ASSISTING IN THE PLACEMENT OF GRADUATES (IN JOBS).

THIS GUIDE, DESIGNED PRIMARILY FOR PLANNING AND DEVELOPMENT OF PROGRAMS IN HIGH SCHOOLS, CAN BE USED BY THE ADVISORY COMMITTEE AS A STARTING POINT, MODIFYING IT TO MEET LOCAL NEEDS. THE PROGRAM CAN ALSO FORM THE BASIS FOR COURSES TO MEET THE REQUIREMENTS OF EMPLOYED ADULTS WHO WISH TO UPGRADE OR UPDATE THEIR SKILLS AND TECHNICAL CAPABILITIES. IN THIS WAY, THE SCHOOL ADMINISTRATION, WITH THE HELP OF THE COMMITTEE AND SPECIAL CONSULTANTS, CAN EFFECTIVELY INITIATE THE NEEDED PROGRAM, QUICKLY DEVELOP IT TO A HIGH LEVEL OF EXCELLENCE, AND MAINTAIN ITS TIMELINESS.

SCIENTIFIC AND TECHNICAL SOCIETIES AND TRADE ASSOCIATIONS

SCIENTIFIC AND TECHNICAL SOCIETIES AND COMMERCIAL FIRMS AND TRADE GROUPS ARE AN IMPORTANT SOURCE OF INSTRUCTIONAL MATERIALS AND OTHER BENEFITS FOR TEACHERS AND STUDENTS. THESE SOCIETIES, IN THEIR PUBLICATIONS AND AT MEETINGS, PROVIDE CONTINUAL EXPOSURE TO THE MOST RECENT DEVELOPMENTS IN THE SCIENCE AND RELATED TECHNOLOGIES AND PROBABLY SERVE AS THE BEST MEANS FOR HELPING KEEP UP-TO-DATE IN A PARTICULAR PHASE OF SCIENCE.

LESS CONSPICUOUS, BUT EXTREMELY IMPORTANT, IS THE SUPPORT WHICH SOCIETIES MAY GIVE IN HELPING TO DEVELOP EVIDENCE OF THE NEED FOR THE TRAINING PROGRAM, PROMOTING THE PROGRAM, ENLISTING MEMBER'S SUPPORT FOR THE PROGRAM, PROVIDING WORK EXPERIENCE FOR STUDENTS, AND HELPING WITH THE PLACEMENT OF GRADUATES.

ASSOCIATIONS AND SOCIETIES MAY SUPPLY RESOURCE PEOPLE TO SPEAK TO CLASSES. THEY MAY ALSO SERVE AS HOSTS TO STUDENT GROUPS ON FIELD TRIPS TO STUDY SPECIFIC PHASES OF THE INDUSTRY.

THE FOLLOWING IS A SELECTED LISTING OF SOME OF THE ORGANIZATIONS AND ASSOCIATIONS WHICH ARE PERTINENT TO THE AGRICULTURAL PRODUCTION INDUSTRY:*

AMERICAN AGRICULTURAL ECONOMIC ASSOCIATION
AMERICAN DAIRY SCIENCE ASSOCIATION
AMERICAN FORAGE AND GRASSLAND COUNCIL
AMERICAN POULTRY ASSOCIATION
AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS
AMERICAN SOCIETY OF AGRONOMY
AMERICAN SOCIETY OF ANIMAL SCIENCE
AMERICAN SOCIETY OF FARM MANAGERS AND RURAL APPRAISERS
AMERICAN SOCIETY OF RANGE MANAGEMENT
BIO-DYNAMIC FARMING AND GARDENING ASSOCIATION
CROP SCIENCE SOCIETY OF AMERICA
FARMLAND INDUSTRIES
FORESTRY CONSERVATION COMMUNICATIONS ASSOCIATION
NATIONAL ASSOCIATION OF ANIMAL BREEDERS
NATIONAL ASSOCIATION COUNTY AGRICULTURAL AGENTS
NATIONAL ASSOCIATION GREENHOUSE VEGETABLE GROWERS
NATIONAL ASSOCIATION OF STATE DEPARTMENTS OF AGRICULTURE
NATIONAL AUDUBON SOCIETY
NATIONAL CHRISTMAS TREE GROWERS ASSOCIATION
NATIONAL CORN GROWERS ASSOCIATION
NATIONAL LIVESTOCK PRODUCERS ASSOCIATION
NATIONAL WILDLIFE FEDERATION
POULTRY SCIENCE ASSOCIATION
SOIL SCIENCE SOCIETY OF AMERICA
WEED SCIENCE SOCIETY OF AMERICA
WILDERNESS SOCIETY
WILDLIFE SOCIETY

EMPLOYMENT OPPORTUNITIES IN AGRICULTURAL PRODUCTION

AGRICULTURAL PRODUCTION, AS THE TITLE INFERS, IS DEFINED AS AN ENTERPRISE WHICH HAS AS ITS MAIN FUNCTION THE PRODUCTION OF FOOD AND/OR FIBER. IN ORDER TO ACCOMPLISH THIS GOAL, A PERSON ENGAGED IN ANY OF THE MANY AGRICULTURAL PRODUCTION OCCUPATIONS SHOULD HAVE A GENERAL KNOWLEDGE IN THE AREAS OF ANIMAL SCIENCE, PLANT SCIENCE, AGRICULTURAL MECHANICS, AND FARM BUSINESS MANAGEMENT.

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* SEE APPENDIX C FOR COMPLETE ADDRESSES OF THESE ORGANIZATIONS AND ASSOCIATIONS

EMPLOYMENT OPPORTUNITIES IN AGRICULTURAL PRODUCTION OCCUPATIONS ARE NOT AS PLENTIFUL AS THEY ONCE WERE DUE TO THE DECREASE EACH YEAR IN THE NUMBER OF FARMS IN THE UNITED STATES. MECHANIZATION OF MANY HARD LABOR JOBS BY FIELD EQUIPMENT HAS LIMITED THE NEED FOR UNSKILLED FARM LABOR. TODAYS FARMER MUST BE A VERY COMPETENT BUSINESS MAN IF HE IS TO REALIZE PROFIT FROM HIS FARMING OPERATION. THE PERSON WHO DESIRES TO BECOME EMPLOYED IN ANY OF THE AGRICULTURAL PRODUCTION OCCUPATIONS MAY DO SO ONLY WITH THE PROPER TRAINING, MOTIVATION TO WORK HARD, AN AWARENESS OF TECHNOLOGICAL CHANGES, AND THE ABILITY TO COPE WITH A RAPIDLY CHANGING AGRIBUSINESS COMPLEX.

AS AGRICULTURAL PRODUCTION OCCUPATIONS HAVE LEVELED OFF TO ABOUT 3% OF THE WORKING POPULATION IN THE UNITED STATES, PERSONS QUALIFIED AND WILLING TO PREPARE FOR CAREERS IN THE FIELD SHOULD FIND ADEQUATE OPPORTUNITIES TO PURSUE THEIR CHOOSEN CAREER. A PARTIAL LIST OF TYPICAL ENTRY LEVEL OCCUPATIONS PRESENTLY FOUND IN THE AGRICULTURAL PRODUCTION AREA FOR PERSONS COMPLETING THE COURSE OUTLINED IN THIS GUIDE MIGHT INCLUDE:

MAJOR OCCUPATIONAL GROUP:	ENTRY LEVEL SKILLED OCCUPATION:	D.O.T. NO.:
LIVESTOCK FARMING	STOCK RANCH FOREMAN (CATTLE, SHEEP, SWINE)	413.131
	SHEEP RANCHER	413.131
	FARM OR RANCH HAND	419.884
	SWINE FARMER	413.181
	ARTIFICIAL INSEMINATOR	467.384
	ANIMAL GROOMER (STABLEMAN-GROOM)	356.874
POULTRY FARMING	POULTRY FARM MANAGER	412.137
	POULTRY FARM HAND	412.884
	POULTRY FARM FOREMAN	412.137
HORSE PRODUCTION	HORSE FARM MANAGER	419.151
	HORSE TRAINER	419.884
	HORSE RANCHER	413.181
	HORSE FARM FOREMAN	413.131
	HORSEMAN, SHOW	41[illegible].181
CROP FARMING	FARM MANAGER	409.168
	FARM FOREMAN	401.138
	FARM LABORER	401.887
	CUSTOM FARM EQUIPMENT OPERATOR	409.883
	GRAIN AND/OR FORAGE FARMER	401.181

VALIDATION OF AGRICULTURAL PRODUCTION UNITS

THE AGRICULTURAL PRODUCTION UNITS HAVE BEEN DEVELOPED THROUGH THE USE OF MANY CURRICULUM GUIDES AND INSTRUCTIONAL MATERIALS ACCUMULATED FROM VARIOUS SOURCES THROUGHOUT THE UNITED STATES. THESE CURRICULUM GUIDES AND INSTRUCTIONAL MATERIALS RANGED FROM TOPIC OUTLINES TO COMPREHENSIVE REFERENCES. THE UNITS CONTAINED IN THIS GUIDE WILL HOPEFULLY PROVIDE A COMPREHENSIVE BASE FOR PROGRAM PLANNING AND DEVELOPMENT OF LOCAL PROGRAMS BY STATE CURRICULUM PLANNERS, STATE SUPERVISORS AND TEACHERS.

OF GREAT VALUE IN DETERMINING COMPETENCIES AND CONTENT INCLUDED IN THE UNIT, WERE CURRICULUM GUIDES AND INSTRUCTIONAL MATERIALS FROM ALABAMA, ARIZONA, CALIFORNIA, COLORADO, FLORIDA, ILLINOIS, IOWA, LOUISIANA, MISSISSIPPI, MISSOURI, MONTANA, NEW YORK, NORTH CAROLINA, OHIO, OKLAHOMA, SOUTH CAROLINA, TEXAS, AND WASHINGTON.

THE TERMINAL OBJECTIVES CITED AT THE BEGINNING OF THE UNITS WERE BASED UPON OCCUPATIONAL ANALYSES CONDUCTED BY THE PROJECT STAFF, AND/OR OTHER OCCUPATIONAL ANALYSES IN THE VARIOUS OCCUPATIONAL CLUSTER AREAS OF AGRICULTURAL PRODUCTION BY VARIOUS INDIVIDUALS THROUGHOUT THE UNITED STATES.

REVISIONS AND IMPROVEMENTS ON THIS GUIDE WERE MADE AS A RESULT OF THE VALUABLE INPUT MADE BY VOCATIONAL AGRICULTURE TEACHERS, STATE AND NATIONAL CURRICULUM SPECIALISTS, AND INDUSTRY REPRESENTATIVES.

IT MUST ALSO BE NOTED THAT, ALTHOUGH THIS SECTION HAS CITED SOURCES OF REFERENCES USED IN DEVELOPING THE GUIDE, THIS IS BY NO MEANS AN EXHAUSTIVE LIST OF MATERIALS ACQUIRED AND USED AS INFORMATION SOURCES. THE STATE OF THE ART OF CURRICULUM MATERIALS IN AGRICULTURAL PRODUCTION, AS FOUND BY THIS PROJECT, IS VERY PROMISING. MANY STATE DEPARTMENTS AND CURRICULUM LABORATORIES HAVE DEVELOPED EXCELLENT INSTRUCTIONAL AIDS, INCLUDING STUDENT MANUALS, FILM STRIPS AND SLIDE SERIES, TRANSPARENCY SETS AND CURRICULUM GUIDES WHICH CAN BE USED AS SUPPLEMENTARY REFERENCE MATERIALS FOR THE UNITS IN THIS GUIDE.

I

AGRICULTURAL PRODUCTION
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UNITS GENERAL TO THE AGRICULTURAL PRODUCTION AREAS

OCCUPATIONAL OPPORTUNITIES IN AGRICULTURAL PRODUCTION
DEVELOPING LEADERSHIP THROUGH FFA
EMPLOYABILITY SKILLS AND HUMAN RELATIONS

OCCUPATIONAL OPPORTUNITIES IN AGRICULTURAL PRODUCTION

UNIT CONCEPT: AGRICULTURAL PRODUCTION INCLUDES A BROAD SPECTRUM OF CAREER OPPORTUNITIES THE STUDENT MAY WISH TO EXPLORE. BY STUDYING THE VARIOUS OCCUPATIONS THE STUDENT IS ABLE TO CONSIDER VARIOUS FACTORS SUCH AS WORKING CONDITIONS, SALARY AND REQUIREMENTS FOR ENTRY THAT WILL INFLUENCE HIS CAREER CHOICE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN SEEKING INFORMATION ABOUT JOB OPPORTUNITIES, SURVEY OR OBTAIN LITERATURE INFORMATION WHICH WILL ASSIST THE STUDENT IN DETERMINING THE NUMBER AND KIND OF JOB OPPORTUNITIES THAT ARE AVAILABLE IN AGRICULTURAL PRODUCTION.

2. WHEN GIVEN A SPECIFIC CAREER WHICH THE STUDENT IS INTERESTED IN, DETERMINE THE COMPETENCIES AND REQUIREMENTS NEEDED BY PERSONS TO ENTER AND ADVANCE IN THAT CAREER.

3. UPON DETERMINING THE REQUIREMENTS AND COMPETENCIES NEEDED TO ENTER A JOB, DEVELOP A PERSONAL PLAN WHICH WILL AID THE STUDENT IN ACQUIRING THE COMPETENCIES AND MEETING THE REQUIREMENTS NEEDED FOR ENTRY IN THAT JOB.

4. UPON IDENTIFYING A JOB IN WHICH THE STUDENT IS INTERESTED, FOLLOW THE PROPER PROCEDURES NECESSARY TO BECOME PLACED ON THE JOB.

5. UPON SECURING PLACEMENT ON A JOB, WORK WITH OTHER EMPLOYEES AND THE EMPLOYER IN A MANNER THAT WILL ENABLE THE STUDENT TO SUCCEED ON THE JOB.

B. INSTRUCTIONAL AREAS

1. ASSESSING THE JOB OPPORTUNITIES AVAILABLE IN AGRICULTURAL PRODUCTION

   A. LOCATING INFORMATION REGARDING THE SCOPE OF AGRICULTURAL PRODUCTION OCCUPATIONS AND THE OPPORTUNITIES FOR EMPLOYMENT

   B. SURVEYING THE LOCAL REGION FOR ENTRY LEVEL JOBS REGARDING THE NUMBER OF OPENINGS PER YEAR AND FUTURE EMPLOYMENT NEEDS

2. MAKING A DETAILED STUDY OF SELECTED AGRICULTURAL PRODUCTION OCCUPATIONS

   A. DETERMINING PERSONAL INTERESTS AND HOW THEY RELATE TO A SPECIFIC JOB OR CLUSTER OF OCCUPATIONS

   B. ASSESSING THE COMPETENCIES THAT ARE NEEDED FOR ENTRY

   C. DETERMINING THE EDUCATIONAL REQUIREMENTS NECESSARY FOR EMPLOYMENT

   D. ASSESSING THE PERSONAL TRAITS REQUIRED BY THE OCCUPATION

   E. DETERMINING THE WORKER BENEFITS IN A GIVEN OCCUPATION

   F. CONSIDERING FEDERAL REGULATIONS WHICH APPLY TO VARIOUS OCCUPATIONS

3. DEVELOPING A PERSONAL PLAN FOR GAINING EXPERIENCES NECESSARY FOR GAINFUL EMPLOYMENT IN A GIVEN OCCUPATIONAL AREA

   A. PLANNING ACTIVITIES THAT WILL ENABLE THE STUDENT TO BE EXPOSED TO EXPERIENCES WHICH WILL AID IN HIS EMPLOYMENT

   B. WORKING WITH COOPERATORS IN DEVELOPING THE OCCUPATIONAL EXPERIENCE PROGRAM

   C. RECORDING THE ACTIVITIES IN THE OCCUPATIONAL EXPERIENCE PROGRAM

   D. SUPERVISING AND EVALUATING THE STUDENT'S OCCUPATIONAL EXPERIENCE PROGRAM

4. SECURING A JOB BY FOLLOWING THE PROPER PROCEDURES INVOLVED IN JOB PLACEMENT

   A. LOCATING POTENTIAL JOBS THROUGH VARIOUS SOURCES

   B. ASSESSING THE JOB DESCRIPTION AND THE STUDENT'S INTERESTS

C. APPLYING FOR A JOB

(1) WRITING A LETTER OF APPLICATION
(2) PREPARING A RESUME
(3) SECURING REFERENCES

D. PARTICIPATING IN A PERSONAL INTERVIEW

5. CONSIDERING FACTORS IMPORTANT TO JOB SUCCESS AND ADVANCEMENT

A. ESTABLISHING RAPPORT WITH FELLOW EMPLOYEES, THE PUBLIC AND THE EMPLOYER

B. PERSONAL GROOMING AND ITS IMPACT UPON THE PUBLIC, THE EMPLOYER AND FELLOW EMPLOYEES

C. FOLLOWING DIRECTIONS AND WORKING INDEPENDENTLY IN AN OCCUPATION

D. DEVELOPING DESIRABLE WORK HABITS

E. CONTINUING SELF IMPROVEMENT ON THE JOB

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. CONDUCT A PERSONAL SURVEY BY PERSONAL CONTACT OR QUESTIONNAIRE OF AGRICULTURAL PRODUCTION OCCUPATIONS TO DETERMINE THE NUMBER OF PERSONNEL EMPLOYEES IN VARIOUS JOBS IN AGRICULTURAL PRODUCTION AND THE NUMBER OF OPENINGS EACH YEAR.

2. INTERVIEW SEVERAL PERSONS IN SPECIFIC OCCUPATIONS AND DETERMINE THE COMPETENCIES AND REQUIREMENTS NEEDED TO ENTER THE OCCUPATION.

3. VISIT THE MANAGER OF AN AREA FARM OR RANCH AND DISCUSS WITH HIM THE FACTORS HE CONSIDERS IN HIRING AN EMPLOYEE.

4. A. WRITE A LETTER OF APPLICATION AND FILL OUT AN APPLICATION FORM. AND HAVE THE CLASS MEMBERS CRITIQUE THEM.

B. USING SIMULATION TECHNIQUES, HAVE THE STUDENTS ROLE PLAY JOB INTERVIEWS. RECORD THE INTERVIEWS ON A TAPE RECORDER AND HAVE EACH STUDENT CRITIQUE HIS OWN PRESENTATION. TO GUIDE THE STUDENTS IN THE CRITIQUE, HAVE THE CLASS DEVELOP A LIST OF CRITERIA FOR JOB INTERVIEWS AND CHECK THEMSELVES AGAINST THESE CRITERIA.

5. USING A PANEL COMPOSED OF EMPLOYERS AND EMPLOYEES, HAVE THE CLASS DISCUSS WITH THEM DEVELOPMENT AND MAINTENANCE OF WORKING RELATIONSHIPS BETWEEN EMPLOYEES AND EMPLOYER.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING A LIST OF AGRICULTURAL PRODUCTION JOB TITLES, HAVE STUDENTS MATCH THESE TO THE MOST APPROPRIATE PRODUCTION AREA SUCH AS BEEF, DAIRY, POULTRY, SWINE, SHEEP, AND CROPS. THESE JOB TITLES COULD ALSO BE MATCHED TO LEVEL OF POSITION SUCH AS SKILLED, SEMI-SKILLED, TECHNICAL AND PROFESSIONAL. THESE TASKS SHOULD BE ACCOMPLISHED WITH 90% ACCURACY TO ALLOW FOR VARIATION IN JOB TITLES NAMES.

2. HAVE STUDENTS DEVELOP A LIST OF POINTS TO REMEMBER OR A CHECK LIST FOR WRITING A LETTER OF APPLICATION FOR A PARTICULAR JOB. THIS LIST SHOULD INCLUDE SUCH ITEMS AS NEATNESS, PROPER INTRODUCTION OF APPLICANT, WHERE APPLICANT CAN BE CONTACTED, REQUEST FOR NECESSARY APPLICATION FORMS, COMPLETENESS, AND PERSONAL REFERENCES.

3. THE STUDENT WILL COMPLETE A SURVEY OF A GIVEN OCCUPATION OR CLUSTER OF OCCUPATIONS TO THE SATISFACTION OF THE TEACHER, WHICH ASSESSES THE COMPETENCIES NEEDED FOR EMPLOYMENT, THE EDUCATIONAL REQUIREMENTS FOR GAINING EMPLOYMENT AND THE PERSONAL CHARACTERISTICS NEEDED FOR SUCCESSFUL EMPLOYMENT.

4. WHEN GIVEN AN "EXAMPLE" JOB, THE STUDENT WILL DESCRIBE, LIST AND EXPLAIN THE STEPS OR PROCEDURE(S) HE WOULD FOLLOW IN ORDER TO BE PLACED ON THE JOB. THIS DESCRIPTION SHOULD INCLUDE: (1) WRITING LETTER OF APPLICATION, (2) PREPARING FOR THE INTERVIEW, AND (3) PRESENTING HIMSELF TO THE EMPLOYER AS A "WORTHY" CANDIDATE.

5. USING ROLE PLAYING WITH A TAPE RECORDER OR VIDEO TAPE, HAVE STUDENTS SIMULATE THE HUMAN RELATIONS ASPECT OF THE WORKING ENVIRONMENT AND "ROLE PLAY" VARIOUS SITUATIONS. EVALUATION SHOULD BE BASED UPON THE STUDENT'S ABILITY TO DEAL WITH FELLOW WORKERS AND/OR CUSTOMERS ACCORDING TO INDUSTRY EXPECTATIONS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF JOB APPLICATION FORMS, LETTERS OF APPLICATION, OCCUPATIONAL SURVEY FORMS, PERSONAL CHARACTERISTICS CHECK LISTS, AND COPIES OF STATE AND FEDERAL LABOR REGULATIONS.

2. APPROPRIATE TABLES, DESKS, CHAIRS AND TAPE RECORDER OR VIDEO-TAPE MACHINES NECESSARY FOR CONDUCTING SIMULATED JOB INTERVIEWS.

3. WRITTEN NOTICES FROM NEWSPAPERS, JOURNALS AND OTHER PUBLICATION LISTING VARIOUS JOB OPENINGS.

F. EXAMPLES OF SUPPORTING REFERENCES

1. BINKLEY, HAROLD AND HAMMONDS, CARSIE. EXPERIENCE PROGRAMS FOR LEARNING VOCATIONS IN AGRICULTURE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. PP. 45-69, 77-92.

   THIS PUBLICATION PRESENTS AN OVERVIEW OF THE EXPERIENCE PROGRAM AND THE OPPORTUNITIES IN AGRICULTURAL PRODUCTION THAT STUDENTS WILL FIND RELATIVELY EASY TO UNDERSTAND.

2. HOOVER, NORMAN K. HANDBOOK OF AGRICULTURAL OCCUPATIONS. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 1-106.

   THIS BOOK GIVES DESCRIPTIONS OF SELECTED OCCUPATIONS IN AGRICULTURAL PRODUCTION WHICH INCLUDES THE NATURE OF THE WORK, WORKING CONDITIONS, EDUCATION AND PERSONAL QUALIFICATIONS AND HOW TO ENTER AND ADVANCE IN THE OCCUPATION.

3. OPPORTUNITIES IN AGRICULTURAL OCCUPATIONS AND THE EMPLOYEE WITHIN THE BUSINESS ORGANIZATION. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, PP. 3-43.

   A STUDENT MANUAL, THIS REFERENCE MAY BE HELPFUL WHEN COVERING SUCH TOPICS AS APPLYING FOR A JOB, ASSESSING ONE'S PERSONAL CHARACTERISTICS, AND LOCATING JOB OPPORTUNITIES.

4. RESOURCE UNIT ON CAREER OPPORTUNITIES FOR CORE CURRICULUM. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA.

   DEVELOPED IN AN OUTLINE FORMAT, THIS REFERENCE WILL BE HELPFUL TO THE INSTRUCTOR IN DEVELOPING QUESTIONS AND PROBLEMS FOR DISCUSSION. INCLUDED IS A LIST OF FILM-STRIPS AND STUDENT ACTIVITIES FOR EXPLORING AGRICULTURAL OCCUPATIONS.

5. STONE, ARCHIE A. CAREERS IN AGRIBUSINESS AND INDUSTRY. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1965, 291 PAGES.

THIS REFERENCE GIVES A GENERAL OVERVIEW OF AGRIBUSINESS OCCUPATIONS AND DEALS WITH OCCUPATIONS FROM AN "ENTERPRISE" VIEWPOINT. CHAPTERS COVER FOOD, DAIRY, GRAIN, FEED, MEAT AND LIVESTOCK, COTTON INDUSTRIES.

DEVELOPING LEADERSHIP THROUGH FFA

UNIT CONCEPT: ACTIVE PARTICIPATION IN THE FFA WILL PROVIDE THE STUDENT OPPORTUNITIES FOR DEVELOPING PRACTICAL TRAINING IN AGRICULTURE, LEADERSHIP, COOPERATION AND CITIZENSHIP.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING THE BASIC PRINCIPLES OF LEADERSHIP, IDENTIFY THE ROLE OF THE FFA ORGANIZATION IN VOCATIONAL AGRICULTURAL EDUCATION.

2. USING THE OFFICIAL FFA MANUAL, IDENTIFY THE HISTORY, AIMS AND PURPOSES AND ORGANIZATION OF THE FFA ON THE LOCAL, STATE AND NATIONAL LEVEL.

3. BY ACTIVELY PARTICIPATING IN THE ORGANIZATION'S BUSINESS MEETING, DEMONSTRATE THE PRINCIPLES OF PARLIAMENTARY PROCEDURE AS PRESENTED IN ROBERT'S RULES OF ORDER OR OTHER ACCEPTABLE REFERENCES.

4. THROUGH ACTIVE PARTICIPATION IN THE ORGANIZATION, SERVE EFFECTIVELY AS A COMMITTEE MEMBER AND/OR CHAIRMAN IN PLANNING AND CARRYING OUT THE CHAPTER PROGRAM OF ACTIVITIES.

5. IF ELECTED, SERVE EFFECTIVELY AS AN OFFICER IN THE ORGANIZATION BY FULFILLING THE DUTIES OF THE OFFICE TO WHICH ELECTED.

6. THROUGH CHAPTER AND CLASSROOM ACTIVITIES, DEVELOP EFFECTIVE PUBLIC SPEAKING SKILLS SO AS TO BE ABLE TO MAKE INTRODUCTIONS, PARTICIPATE IN CONVERSATIONS AND PREPARE AND DELIVER SPEECHES AND TALKS.

7. THROUGH ACTIVE PARTICIPATION IN THE FFA, DEVELOP A STRONG SELF CONCEPT AND A POSITIVE ATTITUDE TOWARD WORKING IN SOCIETY AS EVIDENCED BY HIS PUBLIC AND PRIVATE ACTIVITIES.

B. INSTRUCTIONAL AREAS

1. DEVELOPING LEADERSHIP
    - A. PURPOSES FOR ATTAINING LEADERSHIP SKILLS
    - B. TYPES OF LEADERSHIP
        - (1) FORMAL LEADERSHIP
        - (2) INFORMAL LEADERSHIP
    - C. QUALITIES OF LEADERSHIP
    - D. STYLES OF LEADERSHIP
    - E. FUNCTIONS OF DEMOCRATIC LEADERSHIP
    - F. OPPORTUNITIES FOR DEVELOPING LEADERSHIP ABILITIES
        - (1) HOME
        - (2) SCHOOL
        - (3) COMMUNITY
        - (4) FFA
2. DETERMINING THE PLACE OF FFA IN VOCATIONAL AGRICULTURAL EDUCATION
    - A. THE VALUES OF FFA MEMBERSHIP
    - B. THE CONTRIBUTION OF THE FFA TO THE SCHOOL AND COMMUNITY
3. DETERMINING THE BACKGROUND OF THE FFA
    - A. IMPORTANT HISTORICAL FACTS
    - B. AIMS AND PURPOSES
    - C. COLORS, EMBLEM, MOTTO AND CREED
4. GOVERNING AND FINANCING THE FFA
    - A. LOCAL
    - B. STATE
    - C. NATIONAL
5. ATTAINING FFA MEMBERSHIP AND DEGREES
    - A. TYPES OF MEMBERSHIP

B. LOCAL, STATE AND NATIONAL DEGREES

6. PLANNING AND CONDUCTING A CHAPTER MEETING

    A. IDENTIFYING OFFICER RESPONSIBILITIES

    B. IDENTIFYING MEMBER RESPONSIBILITIES

    C. CONDUCTING THE BUSINESS MEETING

7. PLANNING AND CONDUCTING THE CHAPTER PROGRAM OF ACTIVITIES

    A. IDENTIFYING AREAS TO BE INCLUDED

    B. DEVELOPING A PROGRAM OF ACTIVITIES

    C. CARRYING OUT THE PROGRAM OF ACTIVITIES

        (1) IDENTIFYING CHAIRMAN RESPONSIBILITIES
        (2) IDENTIFYING COMMITTEE MEMBER RESPONSIBILITIES

8. PERFORMING FFA OFFICER DUTIES AND RESPONSIBILITIES

    A. IDENTIFYING QUALIFICATIONS FOR LOCAL, STATE AND NATIONAL OFFICES

    B. IDENTIFYING SPECIFIC DUTIES OF EACH OFFICER

    C. DETERMINING GENERAL RESPONSIBILITIES OF AN OFFICER

        (1) CONDUCTING CHAPTER PROGRAMS
        (2) PARTICIPATING IN OFFICER MEETINGS
        (3) PARTICIPATING IN LEADERSHIP ACTIVITIES
        (4) CONDUCTING CHAPTER MEETINGS

9. DEVELOPING PROFICIENCY IN PARLIAMENTARY PROCEDURE

    A. PRESIDING OVER MEETINGS

    B. PRESENTING MOTIONS CORRECTLY

10. DEVELOPING PUBLIC SPEAKING SKILLS

    A. DEVELOPING CONVERSATION SKILLS

    B. MAKING INTRODUCTIONS

    C. PREPARING A SPEECH OR TALK

    D. DELIVERING A SPEECH OR TALK

11. DETERMINING RESPONSIBILITIES OF FFA MEMBERS

    A. DEVELOPING PERSONAL ATTRIBUTES

        (1) PERSONAL APPEARANCE
        (2) PROPER MANNERS
        (3) BEHAVIOR IN PUBLIC

    B. USING THE FFA CODE OF ETHICS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. ANALYZE THE QUALITIES OF RECOGNIZED GOOD LEADERS.

2. ATTEND STATE AND/OR NATIONAL FFA CONVENTIONS TO OBSERVE THE OPERATION OF THE ORGANIZATION.

3. A. PARTICIPATE IN CLASSROOM STUDY AND PRACTICE OF PARLIAMENTARY PROCEDURE TO DEVELOP PARLIAMENTARY PROCEDURE SKILLS.

   B. PLAN AND POST AGENDA IN ADVANCE OF REGULAR CHAPTER MEETINGS TO PROMOTE ATTENDANCE AND PARTICIPATION BY ALL MEMBERS.

   C. ATTEND AND PARTICIPATE IN FFA MEETINGS TO DEVELOP LEADERSHIP ABILITIES.

   D. PREPARE FOR AND PARTICIPATE IN PARLIAMENTARY PROCEDURE DEMONSTRATIONS AND CONTESTS.

4. A. ACCEPT AN FFA COMMITTEE ASSIGNMENT SUITED TO INTEREST AND ABILITY TO DEVELOP SKILLS IN COMMITTEE WORK.

   B. SERVE AS A COMMITTEE CHAIRMAN TO DEVELOP LEADERSHIP SKILLS.

   C. PREPARE WRITTEN AND ORAL COMMITTEE REPORTS AND PRESENT THEM AT FFA MEETINGS TO DEVELOP PERSONAL SKILLS AND TO FACILITATE OPERATION OF THE ORGANIZATION.

   D. PARTICIPATE IN SPECIAL TRAINING PROGRAMS FOR COMMITTEE CHAIRMEN TO OBTAIN SKILLS IN COMMITTEE WORK.

5. A. ARRANGE FOR ELECTION OF FFA OFFICERS AND PARTICIPATE AS AN OFFICER, IF ELECTED.

   B. PLAN, CONDUCT AND/OR PARTICIPATE IN LEADERSHIP WORKSHOPS OR OFFICER-TRAINING PROGRAMS.

6. A. PARTICIPATE IN CLASSROOM DISCUSSIONS, DEMONSTRATIONS, ORAL AND WRITTEN REPORTS, AND LOCAL PUBLIC SPEAKING COMPETITION.

   B. ENTER PUBLIC SPEAKING CONTESTS ABOVE THE LOCAL LEVEL.

   C. PARTICIPATE IN LEADERSHIP ACTIVITIES ABOVE THE LOCAL LEVEL.

   D. PRACTICE MAKING FORMAL INTRODUCTIONS THROUGH ROLE PLAYING.

   E. HAVE EACH STUDENT PREPARE A SHORT TALK OR SPEECH TO PRESENT IN CLASS, USING A TAPE RECORDER OR VIDEOTAPE FOR THE STUDENT TO HEAR AND/OR OBSERVE HIS PERFORMANCE.

7. CONDUCT A SELF-EVALUATION OF LEADERSHIP QUALITIES, PERSONALITY CHARACTERISTICS, AND OTHER PERSONAL ATTRIBUTES, IDENTIFYING STRONG POINTS TO BUILD UPON AND WEAK POINTS NEEDING IMPROVEMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THE QUALITIES OF A DEMOCRATIC LEADER SO THAT ATTAINMENT OF THE QUALITIES WOULD RESULT IN A PERSON DISPLAYING DEMOCRATIC LEADERSHIP.

2. DEVELOP A MATCHING TEST IN WHICH EACH STUDENT WOULD MATCH THE PARTS OF THE FFA EMBLEM WITH WHAT IT SYMBOLIZES WITH COMPLETE ACCURACY.

3. DIVIDE THE CLASS INTO GROUPS TO PRESENT A BUSINESS MEETING. THE TEACHER SHOULD EVALUATE EACH GROUP AND MEMBER AS TO THEIR POISE AND KNOWLEDGE OF PARLIAMENTARY PROCEDURE.

4. HAVE EACH MEMBER ASSIGNED RESPONSIBILITIES FOR ASSISTING IN PLANNING AND CONDUCTING THE CHAPTER PROGRAM OR ACTIVITIES. EVALUATE EACH MEMBER IN REFERENCE TO COMPLETION OF HIS ASSIGNED TASKS AND THE IMPROVEMENT THAT HE EXHIBITS OVER EACH GRADING PERIOD.

5. HAVE THE SECRETARY, TREASURER, AND REPORTER REGULARLY SUBMIT THEIR BOOKS TO THE AUDITING COMMITTEE AND TEACHER FOR EVALUATION AS TO COMPLETENESS, NEATNESS AND ACCURACY.

6. CONDUCT A PUBLIC SPEAKING CONTEST IN EACH CLASS FOR THE TEACHER TO EVALUATE EACH STUDENT FOR HIS PRESENTATION IN RELATION TO HIS SPEAKING ABILITIES.

7. HAVE EACH STUDENT COMPLETE A PERSONAL EVALUATION FORM AS TO HIS ATTITUDES TOWARD HIMSELF AND SOCIETY. THE TEACHER SHOULD PRIVATELY DISCUSS THE PERSONAL EVALUATION WITH EACH STUDENT TO RECOGNIZE STRONG POINTS AND WEAK POINTS NEEDING IMPROVEMENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OFFICIAL FFA PARAPHERNALIA
2. OFFICIAL FFA SECRETARY'S AND TREASURER'S BOOKS
3. OFFICIAL FFA SCRAPBOOK
4. TAPE RECORDER OR VIDEO-TAPE

F. EXAMPLES OF SUPPORTING REFERENCES

1. BENDER, RALPH E. THE FFA AND YOU. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1962, 494 PAGES.

   THIS TEXT COVERS ALL AREAS OF FFA PROGRAM ACTIVITIES AS WELL AS OFFICER AND MEMBER DUTIES AND RESPONSIBILITIES. IT IS AN EXCELLENT REFERENCE FOR BEGINNING MEMBERS AND OFFICERS.

2. MEMBERSHIP - THE PATHWAY TO LEADERSHIP. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 23 PAGES.

   AN AID FOR TEACHER UNIT PLANNING AND FOR THE STUDENT, THIS BOOKLET EMPHASIZES FUNDAMENTAL LEADERSHIP COMPETENCIES TO BE DEVELOPED BY ALL MEMBERS.

3. OFFICIAL MANUAL, FUTURE FARMERS OF AMERICA. ALEXANDRIA, VIRGINIA: FUTURE FARMERS SUPPLY SERVICE. 1972, 128 PAGES.

   THIS MANUAL WILL ASSIST BOTH MEMBERS AND ADVISORS IN GAINING AN UNDERSTANDING OF THE HISTORY, ORGANIZATION AND OPERATING OF THE FFA.

4. STEWART, W.F. HELPS IN MASTERING PARLIAMENTARY PROCEDURE. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY.

A SIMPLE AND EASILY UNDERSTOOD BOOKLET CONTAINING THE BASIC RULES OR PARLIAMENTARY PROCEDURE. IT ALSO INCLUDES A QUICK REFERENCE CHART WITH REQUIREMENTS FOR EACH TYPE OF MOTION.

EMPLOYABILITY SKILLS AND HUMAN RELATIONS

UNIT CONCEPT: JOB PROCUREMENT, JOB ADVANCEMENT, AND GENERAL CAREER SUCCESS ARE PROMOTED THROUGH THE DEVELOPMENT OF COMPETENT COMMUNICATION SKILLS AND GOOD HUMAN RELATIONS

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WRITE A PERSONAL RESUME AND LETTER OF APPLICATION, COMPLETE EMPLOYMENT APPLICATIONS AND CONDUCT HIMSELF IN AN INTERVIEW IN SUCH A MANNER THAT HE WILL BE ABLE TO PROCURE A JOB.
2. EFFECTIVELY CARRY ON A TELEPHONE CONVERSATION, INCLUDING INITIATING CONVERSATIONS, ANSWERING THE TELEPHONE, FORMULATING RESPONSES AND TAKING TELEPHONE MESSAGES.
3. EFFECTIVELY HANDLE A SALES PROCEDURE USING THE SIX BASIC STEPS IN SELLING PRODUCTS FROM AGRICULTURAL PRODUCTION OPERATIONS.
4. IN WORKING IN AN AGRICULTURAL PRODUCTION OCCUPATION, IMPROVE HIS RELATIONS WITH FELLOW EMPLOYEES, EMPLOYER, SUPERVISORS AND THE PUBLIC AS EVALUATED BY THE EMPLOYER USING CRITERIA SUCH AS APPEARANCE, PUNCTUALITY, DEPENDABILITY, INTEREST, JUDGEMENT, PRODUCTION, INITIATIVE AND COOPERATION.

B. INSTRUCTIONAL AREAS

1. PROCURING THE JOB
   - A. WRITING LETTERS OF APPLICATION
   - B. PREPARING PERSONAL DATA SHEETS
   - C. FILLING OUT EMPLOYMENT APPLICATIONS
   - D. INTERVIEWING
   - E. OBTAINING SOCIAL SECURTIY NUMBER AND BIRTH CERTIFICATE

2. IMPROVING COMMUNICATIONS SKILLS

   A. COMMUNICATING VIA TELEPHONE

      (1) INITIATING A TELEPHONE CONVERSATION
      (2) ANSWERING THE TELEPHONE
      (3) LISTENING TO TELEPHONE CONVERSATION AND FORMULATING RESPONSES
      (4) TERMINATING A TELEPHONE CONVERSATION
      (5) TAKING AND DELIVERING TELEPHONE MESSAGES

   B. COMMUNICATING THOUGHTS AND FACTS CLEARLY BY WRITING

      (1) USING TECHNICAL TERMS
      (2) USING CORRECT SPELLING AND GRAMMAR

3. IMPROVING SALES SKILLS

   A. DEVELOPING THE APPROACH

   B. FINDING CUSTOMERS' NEEDS AND DESIRES

   C. HELPING CUSTOMERS EXAMINE THE GOODS OR SERVICES

   D. ANSWERING CUSTOMERS' QUESTIONS AND OBJECTIVES

   E. COMPLETING THE SALE

   F. SUGGESTING ADDITIONAL MERCHANDISE OR SERVICE

4. IMPROVING ON THE JOB

   A. KEEPING THE JOB

      (1) DEVELOPING EMPLOYER-EMPLOYEE RELATIONS
      (2) DEVELOPING SUPERVISOR-EMPLOYEE RELATIONS THROUGH GIVING AND RECEIVING CONSTRUCTIVE CRITICISM
      (3) DEVELOPING EMPLOYEE-EMPLOYEE RELATIONS
      (4) DEVELOPING CLIENT OR CUSTOMER-EMPLOYEE RELATIONS

   B. GROWING ON THE JOB

      (1) DEVELOPING EFFECTIVE WORK HABITS
      (2) IMPROVING TECHNICAL SKILLS

         (A) PLANNING FOR ADVANCEMENT
         (B) DEVELOPING SOCIAL CONSCIOUSNESS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USE ROLE-PLAYING AMONG THE STUDENTS TO PRACTICE JOB INTERVIEWS.

   B. WRITE LETTERS REQUESTING SOCIAL SECURITY CARD AND BIRTH CERTIFICATE.

2. HAVE THE STUDENT RECORD A TELEPHONE CONVERSATION OF HIMSELF AND COMPLETE A SELF-RATING VOICE SCALE.

3. HAVE STUDENTS PARTICIPATE IN AN AGRICULTURAL SUPPLIES OR PRODUCTS SALES CAMPAIGN.

4. HAVE STUDENTS SURVEY SEVERAL AGRICULTURAL PRODUCTION BUSINESSES OR INDUSTRIES AND INTERVIEW THE PERSONNEL DIRECTOR, MANAGER OR OWNER TO IDENTIFY FACTORS IMPORTANT TO HUMAN RELATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DEVELOP A PERSONAL RESUME, WRITE LETTERS FOR JOB APPLICATION, COMPLETE JOB APPLICATION FORMS AND DISPLAY THE QUALITIES NEEDED FOR A SUCCESSFUL JOB INTERVIEW.

2. HAVE EACH STUDENT CONDUCT A SIMULATED BUSINESS TRANSACTION USING THE TELEPHONE TO THE SATISFACTION OF THE TEACHER.

3. HAVE EACH STUDENT PRESENT SUPPLIES AND/OR SERVICES TO CUSTOMERS IN A SIMULATED SETTING TO THE SATISFACTION OF THE TEACHER.

4. HAVE EACH STUDENT USE AN APPROPRIATE RATING SCALE FOR SELF-EVALUATION OF HIS HUMAN RELATIONS ABILITIES WITH EMPLOYEES, CUSTOMERS, SUPERVISORS AND EMPLOYER(S).

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TAPE RECORDER AND/OR VIDEO TAPE

2. TELEPHONES

F. EXAMPLES OF SUPPORTING REFERENCES

1. HUMAN RELATIONS IN AGRI-BUSINESS. EAST LANSING, MICHIGAN: DEPARTMENT OF SECONDARY EDUCATION AND CURRICULUM, MICHIGAN STATE UNIVERSITY.

THIS PUBLICATION IS INTENDED TO BE USED AS A STUDENT MANUAL FOR INDIVIDUALIZED INSTRUCTION. INCLUDED IS A BRIEF TEXT ON VARIOUS TOPICS IN HUMAN RELATIONS FOLLOWED BY STUDENT ACTIVITIES OR EXERCISES TO EVALUATE THE STUDENT'S COMPREHENSION OF THE TOPIC DISCUSSED.

2. HUMAN RELATIONS IN BUSINESS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, 70 PAGES.

THE STUDENT REFERENCE INCLUDES BRIEF YET COMPREHENSIVE DISCUSSIONS AND EXERCISES, INCLUDING CASES, WHICH THE STUDENT CAN READ AND COMPLETE TO OBTAIN A BETTER UNDERSTANDING OF THE HUMAN RELATIONS PROCESS.

3. RESOURCE UNIT ON HUMAN RELATIONS. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA. 1971, 90 PAGES.

IN THIS REFERENCE FOR TEACHERS, THE COMPLETE AREA OF HUMAN RELATIONS IS COVERED IN OUTLINE FORM. NUMEROUS CASE PROBLEMS ARE PRESENTED FOR STUDENTS AND TEACHERS TO CONSIDER DURING DISCUSSION PERIODS. VARIOUS RATING FORMS FOR SELF-EVALUATION ARE INCLUDED WHICH THE STUDENTS MAY COMPLETE. SAMPLE TEST ITEMS ARE ALSO INCLUDED.

II

ANIMAL SCIENCE

U.S.O.E. CODE 01.01 01 00 00

LIVESTOCK SELECTION

SELECTING BREEDING MATES

PREPARING THE FEMALE FOR BREEDING

DETECTING PROPER TIME FOR BREEDING

ARTIFICIAL BREEDING

THE DEVELOPING FETUS

CARE OF FEMALE DURING GESTATION

CARE AND MANAGEMENT OF FEMALE AND OFFSPRING AT PARTURITION

REBREEDING LIVESTOCK

BREEDING SYSTEMS

MANAGEMENT AND FUNCTION OF THE MALE BREEDING ANIMAL

LIVESTOCK NUTRITIVE REQUIREMENTS

THE FOOD NUTRIENT GROUPS AND THEIR FUNCTIONS IN THE ANIMAL BODY

THE DIGESTION, ABSORPTION AND METABOLISM OF FOOD IN LIVESTOCK

SELECTION OF FEEDS ACCORDING TO NUTRITIVE VALUE

BALANCING RATIONS FOR LIVESTOCK

SUCCESSFUL FEEDING PROCEDURES FOR VARIOUS LIVESTOCK OPERATIONS

LEGAL IMPLICATIONS OF FEED ADDITIVES

ACUTE HEALTH DISORDERS RELATED TO NUTRITION

ANIMAL SCIENCE (CONTINUED)

STORAGE AND HANDLING OF LIVESTOCK FEEDS

SANITATION AND ANIMAL HEALTH

DETECTING AND CONTROLLING COMMON LIVESTOCK DISEASES

DETECTING AND CONTROLLING ANIMAL PARASITES

DETECTING AND CONTROLLING HEALTH DISORDERS DUE TO POISONOUS PLANTS

SUPPLY AND DEMAND IN MARKETING AND PRICE TRENDS AND CYCLES

MARKET CLASSES AND GRADES OF LIVESTOCK

SELECTING APPROPRIATE LIVESTOCK MARKETING METHODS

PREPARING AND HANDLING LIVESTOCK FOR MARKETING

MARKETING MILK AND DAIRY PRODUCTS

MARKETING POULTRY AND EGGS

SELECTING LIVESTOCK HOUSING

MAINTAINING ENVIRONMENTAL CONDITIONS IN LIVESTOCK HOUSING

LIVESTOCK AND MATERIALS HANDLING AND STORAGE

HANDLING LIVESTOCK AND POULTRY

CASTRATING, DEHORNING, IDENTIFYING AND INJECTING LIVESTOCK

DOCKING, SHEARING, TRIMMING FEET AND WORMING SHEEP

PREPARING FOR SHOW AND SHOWING LIVESTOCK

THE PROCESSES INVOLVED IN MILKING COWS

LIVESTOCK SELECTION

UNIT CONCEPT: LIVESTOCK VARY CONSIDERABLY IN CHARACTERISTICS AS A RESULT OF GENETICS AND ENVIRONMENT, SUCH AS, ABILITY TO PRODUCE AND REPRODUCE, WHICH HAVE A LARGE EFFECT ON THE POSSIBLE ECONOMIC RETURNS FROM A PRODUCTION ENTERPRISE. THE LIVESTOCK PRODUCER MUST BE AWARE OF THE CHARACTERISTICS WHICH MAKE SUPERIOR QUALITY ANIMALS FOR GIVEN USES AND THE STRATEGIES WHICH ARE MOST EFFECTIVE IN IDENTIFYING THE DESIRED TYPE OF ANIMAL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FROM A GROUP OF LIVESTOCK WITHIN ONE SPECIES, DISTINGUISH THOSE ANIMALS THAT ARE SUPERIOR ACCORDING TO A PHENOTYPIC OR TYPE SELECTION PROCESS AS DETERMINED BY MARKET DEMANDS.

2. USING THE PEDIGREES FOR A SMALL GROUP OF LIVESTOCK WITHIN ONE SPECIES, DISTINGUISH THE ANIMALS WHICH APPEAR TO HAVE SUPERIOR INHERITANCE FOR SELECTED TRAITS AS DETERMINED BY EVIDENCE PRESENTED ON THE ANCESTORS.

3. GIVEN THE PRODUCTION TESTING DATA OF A GROUP OF ANIMALS WITHIN ONE SPECIES, DETERMINE THOSE ANIMALS THAT ARE SUPERIOR BASED ON THE EVALUATION OF THEIR PAST OR PRESENT PERFORMANCE.

4. FROM A GROUP OF ANIMALS WITHIN ONE SPECIES, DISTINGUISH THOSE ANIMALS THAT ARE SUPERIOR ACCORDING TO A COMBINATION OF TYPE, PEDIGREE AND PRODUCTION TESTING SELECTION PROCEDURES TO INSURE THAT THOSE ANIMALS SELECTED WILL MEET THEIR PRODUCTIVE PURPOSE EFFICIENTLY AND ECONOMICALLY.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE PURPOSES OF LIVESTOCK SELECTION
   - A. IMPROVEMENT OF SPECIES
   - B. ECONOMIC IMPROVEMENT
   - C. CONSUMER INPUT INTO SELECTION PROCESS

*2. PRACTICING SELECTION BY TYPE (PHENOTYPIC SELECTION)

A. IDENTIFYING THE CORRECT NAMES AND LOCATIONS OF THE BODY PARTS

(1) IMPORTANCE OF NAMES AND LOCATION OF BODY PARTS

(A) COMMUNICATION ABOUT ANIMALS (REASONS)
(B) CORRECT TERMINOLOGY BETWEEN SPECIES
(C) BASIC TO PHENOTYPIC SELECTION

(2) SPECIES AND THEIR BODY PARTS

(A) MALE
(B) FEMALE
(C) CASTRATED MALE

* Place each of the species of animals under study in B.2 above and review location and names of important body parts.

B. REVIEWING A JUDGING SCORE CARD, IF AVAILABLE

(1) PURPOSE OF SCORE CARD ("IDEAL" TYPE OF SPECIES)
(2) UTILIZING THE SCORE CARD
(3) PROCEDURE TO FOLLOW IN SELECTING, ON TYPE, SPECIES FOR WHICH A SCORE CARD HAS NOT BEEN DEVELOPED
(4) USE OF DAIRY CATTLE SCORE CARD TO ILLUSTRATE PURPOSE AND USE OF SCORE CARD

C. DETERMINING THE COMMON FAULTS OF THE VARIOUS LIVESTOCK

*(1) SPECIES
(2) DEFINING THE FAULT
(3) AMOUNT OF EMPHASIS TO PUT ON FAULT WHEN OBSERVED (EXAMPLE: DIARY CATTLE)

(A) PENDULOUS UDDER
(B) RYE TAIL

* Place each species under study in B.2.c.(1) above and observe the common faults particular to that species.

D. DEVELOPING A KEEN OBSERVATION AND SOUND JUDGMENT

*(1) OBSERVATION OF BOTH GOOD CONFORMATION AND DEFECTS
(2) WEIGHING AND EVALUATING THE RELATIVE IMPORTANCE OF GOOD AND BAD TRAITS

* Place each species under study in B.2.d.(1) and apply appropriate information.

E. DEVELOPING A LOGICAL PROCEDURE TO FOLLOW IN TYPE SELECTION

(1) OBSERVATION OF LIVESTOCK FROM A DISTANCE
(2) CLOSE INSPECTION AND HANDLING LIVESTOCK
(3) OBSERVATION OF ANIMALS WHILE THEY ARE MOVING
(4) VIEWING AN ANIMAL FROM ALL DIRECTIONS

(A) SIDE VIEW
(B) REAR VIEW
(C) FRONT VIEW

3. DETERMINING THE PURPOSE OF PEDIGREE SELECTION

A. ANCESTORAL EVALUATION OF A SPECIFIC ANIMAL

B. MAY CONTAIN SOME PRODUCTION DATA

C. PRACTICAL USE OF PROCESS

D. ADVANTAGES AND DISADVANTAGES OF PEDIGREE SELECTION

4. SELECTING LIVESTOCK ON THE BASIS OF PEDIGREE INFORMATION

A. TYPES OF INFORMATION INCLUDED IN PEDIGREES

(1) ANCESTRY
(2) PRODUCTION
(3) SHOW RING WINNINGS
(4) CLASSIFICATION DATA

B. USING THE PEDIGREE TO DETERMINE RELATIONSHIP OR IMPORTANCE OF RELATIVES

C. SELECTING THOSE ANIMALS WITH ATTRIBUTES DESIRED

D. EVALUATING USEFULNESS OF PEDIGREE INFORMATION

5. DETERMINING THE PURPOSE OF SELECTION ON THE BASIS OF PRODUCTION TESTING DATA

A. SUBJECTIVE EVALUATION PROCESS

B. IMPORTANCE TO MODERN ANIMAL IMPROVEMENT

6. IDENTIFYING THE TYPES OF PRODUCTION TESTING AVAILABLE

A. PERFORMANCE TESTING

(1) ADVANTAGES
(2) DISADVANTAGES

B. PROGENY TESTING

(1) ADVANTAGES
(2) DISADVANTAGES

C. EXAMPLES OF DIFFERENT PRODUCTION TESTING PROCEDURES

(1) DAIRY CATTLE

(A) DAIRY HERD IMPROVEMENT ASSOCIATION (DHIA)
(B) DAIRY HERD IMPROVEMENT RECORDS (DHIR)
(C) OTHER PROCEDURES

(2) MEAT ANIMALS

(A) STATE-OPERATED TESTING STATIONS
(B) BREED ASSOCIATION GUIDES

(3) POULTRY

(A) TRAP NESTING
(B) CAGE OPERATION

7. PRACTICING SELECTION OF ANIMALS BASED ON PRODUCTION TESTING

A. TANDEM SELECTION

B. ESTABLISHING MINIMUM STANDARDS FOR EACH CHARACTER AND SELECTING SIMULTANEOUSLY BUT INDEPENDENTLY FOR EACH CHARACTER

C. SELECTION INDEX

8. EVALUATING USEFULNESS OF SELECTION BASED ON PRODUCTION TESTING

A. RELATIONSHIP TO OTHER SELECTION PROCESSES

B. UTILITY IN FUTURE

9. DETERMINING THE PURPOSE OF SELECTION BASED ON SHOW RING WINNINGS

A. NUMEROUS LIVESTOCK SHOWS

B. INFLUENCE ON BREED TYPE

C. PUBLIC INFORMATION

10. PRACTICING SELECTION BASED ON SHOW RING PERFORMANCE

A. EVALUATION OF RECORDS OF WINNINGS

B. SELECTING ANIMALS

(1) ECONOMICS
(2) BLOOD LINES
(3) TRANSPORTATION

11. ADVANTAGES AND DISADVANTAGES OF USE OF SHOW RING WINNINGS AS BASIS FOR SELECTION

12. SELECTION BASED ON THE COMPOSITE OF PHENOTYPE, PEDIGREE, PRODUCTION TESTING AND SHOW RING WINNINGS METHOD OF EVALUATING ANIMALS

A. ADVANTAGES OF THIS PROCEDURE

(1) ACCURACY
(2) SATISFACTION WITH CHOICE

B. PRACTICING THIS PROCEDURE OF SELECTION

(1) EVALUATION OF PRODUCTION RECORDS
(2) EVALUATION OF PEDIGREES
(3) EVALUATION OF SHOW RING WINNINGS (IF ANY)
(4) EVALUATION OF LIVE ANIMAL
(5) SELECTING ANIMAL BASED ON FOUR-WAY APPRAISAL

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. SUPPLY STUDENTS WITH BLANK DIAGRAM OF A PARTICULAR KIND OF LIVESTOCK, SUCH AS, BEEF CATTLE, SHEEP OR SWINE. HAVE EACH STUDENT FILL IN AND LEARN THE PROPER NAME FOR EACH PART OF THAT ANIMAL SO THAT HE MIGHT VERBALLY DESCRIBE THAT ANIMAL MORE INTELLIGENTLY.

2. PROVIDE EACH STUDENT WITH A LIVESTOCK SALE CATALOG (DISPERSAL OR CONSIGNMENT). TELL EACH STUDENT HE HAS $2,000.00 AT HIS DISPOSAL AND HE MUST DETERMINE, BY LOOKING THROUGH THE CATALOG, WHICH ANIMALS HE WOULD LIKE TO POSSIBLY BUY ON THE BASIS OF THEIR PEDIGREE AS PROVIDED IN THE CATALOG.

3. ARRANGE FOR A FIELD TRIP TO A LOCAL FARM (ONE OF THE STUDENTS', IF POSSIBLE) ON A DAY WHEN THEY ARE WEIGHING AND GRADING OR PERFORMING SOME OTHER FORM OF PRODUCTION TESTING. HAVE THE STUDENTS OBSERVE THE ANIMALS AND ALSO THE DATA OBTAINED FROM PAST RECORDS.

4. ATTEND A LIVESTOCK DISPERSION OR CONSIGNMENT SALE WITH THE STUDENTS. PRIOR TO THE SALE, HAVE THE STUDENTS

REVIEW THE SALE CATALOG AND MARK THOSE ANIMALS THEY THINK ARE MOST DESIRABLE THROUGH THE PEDIGREE AND PRODUCTION TESTING INFORMATION. THEN, AT THE SALE, HAVE EACH STUDENT MAKE HIS FINAL APPRAISAL OF WHAT ANIMALS HE WOULD SELECT FOR HIMSELF BASED ON THE COMBINATION OF PEDIGREE, PRODUCTION TESTING AND PHENOTYPIC SELECTION PROCESSES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE THE STUDENT WITH A CLASS OF FOUR LIVESTOCK OF THE SAME SPECIES. HAVE EACH STUDENT PLACE THESE ANIMALS AS TO THEIR DESIRABILITY AS COMPARED TO THE "IDEAL" TYPE OF THAT SPECIES. STUDENT PLACINGS SHOULD BE MARKED ON CARDS (PROVIDED BY THE TEACHER) AND TURNED IN TO THE TEACHER BEFORE DISCUSSING THE PROPER PLACING OF THIS CLASS OF LIVESTOCK.

2. HAVE EACH STUDENT EXPLAIN THE VALUE OF THE PEDIGREE SELECTION PROCESS AND LIST THE STRENGTHS AND WEAKNESSES OF THAT PARTICULAR PROCESS.

3. PROVIDE EACH STUDENT WITH THE PRODUCTION TESTING DATA OF A SPECIFIC ANIMAL. HAVE THE STUDENT ANALYZE IN WRITING THE DATA AND GIVE REASONS AS TO HOW AND WHY THIS ANIMAL EXCELLED OR DID POORLY IN CERTAIN AREAS AS DEFINED BY THE RECORDS.

4. HAVE THE STUDENT DEFINE IN WRITING ALL OF THE PROCESSES BY WHICH LIVESTOCK SELECTION MAY BE ACCOMPLISHED AND FURTHER STATE IF ONE PARTICULAR PROCESS OR A COMBINATION OF ALL OF THE PROCESSES IS THE MOST EFFECTIVE METHOD FOR SELECTION, GIVING REASONS FOR HIS OPINION ON THE MATTER.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CATALOGS FOR AN UPCOMING LIVESTOCK CONSIGNMENT OR DISPERSION SALE

2. DIAGRAMS AND PICTURES OF THE VARIOUS LIVESTOCK FOR CLASSROOM DISCUSSION

3. PICTURES OF THE "IDEAL" TYPE AS DEFINED BY THE VARIOUS LIVESTOCK BREED ASSOCIATIONS

4. SLIDES OR MOVIES RELATED TO THE PROCEDURES USED IN SELECTION

5. ACTUAL LIVESTOCK FOR STUDENTS TO PRACTICE SELECTION TECHNIQUES

6. PRODUCTION TESTING DATA FOR REVIEW BY STUDENTS

7. LIVESTOCK MARKING CRAYON (ESPECIALLY NEEDED WHEN JUDGING SWINE)

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, 756 PAGES.

   THIS BOOK INCLUDES A CHAPTER DEVOTED TO THE DISCUSSION OF LIVESTOCK SELECTION (EXCLUDING CHICKENS) AND IS EASILY READ AND WELL ILLUSTRATED FOR BETTER UNDERSTANDING OF SOME OF THE JUDGING CONCEPTS.

2. HOW TO JUDGE A CLASS OF ANGUS CATTLE. ST. JOSEPH, MISSOURI: AMERICAN ANGUS ASSOCIATION. 1970.

   A VERY WELL ILLUSTRATED, EASILY READ PAMPHLET, IT DEALS WITH HOW TO JUDGE ABERDEEN ANGUS ALTHOUGH SOME OF THE PRINCIPLES APPLY TO ALL BEEF CATTLE.

3. SELECTING, FEEDING AND SHOWING DAIRY CATTLE. LOS ANGELES, CALIFORNIA: ALBER MILLING COMPANY. 1966, 31 PAGES.

   THIS BOOKLET PROVIDES A UNIT ON SELECTING DAIRY CATTLE. IT IS WELL ILLUSTRATED AND IS WRITTEN AT THE STUDENT LEVEL.

4. SELECTING, FEEDING AND SHOWING HORSES. KANSAS CITY, MISSOURI: ALBER MILLING COMPANY. 1964, 62 PAGES.

   THIS BOOKLET PROVIDES AN ILLUSTRATED CHART WITH DISCUSSION ON HOW TO JUDGE LIGHT HORSES. PRINTING IS SMALLER THAN REGULAR, BUT COULD BE USED BY STUDENTS WITH NORMAL EYESIGHT.

SELECTING BREEDING MATES

UNIT CONCEPT: ENVIRONMENT AND HEREDITY ARE THE MAIN FOUNDATIONS OF PROFITABLE LIVESTOCK PRODUCTION. GOOD HEREDITY MUST BE BUILT INTO THE ANIMAL FOR THE BREEDER TO GET THE MOST FROM GOOD ENVIRONMENT. SELECTION OF SUPERIOR BREEDING MATES MOST OFTEN PROVIDES THE LIVESTOCK BREEDER WITH GENETICALLY SUPERIOR OFFSPRING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR A GIVEN BREEDING FEMALE AND USING PEDIGREES AND PRODUCTION RECORDS, SELECT A MALE TO MATE WITH THAT FEMALE TO INCREASE THE PROBABILITY OF A SUPERIOR OFFSPRING.

2. GIVEN ANIMALS OF BREEDING AGE, CULL THOSE ANIMALS WHICH DO NOT MEASURE UP WITH THE SELECTION STANDARDS AS SET FORTH BY PAST AND PRESENT BREEDING RECORDS OF ANIMAL PERFORMANCE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THOSE TRAITS WHICH ARE ECONOMICALLY IMPORTANT

   A. BODY CONFORMATION AND PHYSICAL APPEARANCE

      (1) POTENTIAL DRESSING PERCENT AND HIGH VALUE CUTS ON MEAT ANIMALS
      (2) STRUCTURE WHICH INDICATES STRENGTH AND VIGOR
      (3) BONE AND MUSCLE STRUCTURE WHICH WILL AID IN EASE OF BEARING OFFSPRING
      (4) MAMMARY SYSTEMS WHICH INDICATE SUCKLING ABILITY AND ADEQUATE LEVELS OF MILK PRODUCTION
      (5) SOUND INTERNAL AND EXTERNAL HEALTH
      (6) CONGENITAL WEAKNESSES

   B. GROWTH RATE

      (1) RAPID GROWTH TO MATURITY FOR EARLY BREEDING AGE
      (2) RAPID GROWTH FOR EARLY MARKETING AND REDUCED LABOR AND FACILITY NEEDS

   C. FEED EFFICIENCY

      (1) RATIO OF FEED TO POUNDS OF GAIN

        - (2) RATIO OF FEED TO MILK OR EGG PRODUCTION

    - D. ANIMAL TEMPERAMENT

        - (1) OVERLY AGGRESSIVE
        - (2) OVERLY RESERVED OR SKITTISH
        - (3) TENDENCY TO CLAIM AND MOTHER OFFSPRING

    - E. PRODUCTION CHARACTERISTICS

        - (1) MILK PRODUCTION

            - (A) LEVELS OF PRODUCTION
            - (B) DURATION OF HIGH LEVELS OF MILK
            - (C) AMOUNT OF BUTTERFAT AND MILK SOLIDS-NOT-FAT

        - (2) EGG PRODUCTION

            - (A) LAYING PERCENTAGES
            - (B) SIZE AND QUALITY OF EGGS

        - (3) WOOL PRODUCTION

            - (A) POUNDS OF WOOL
            - (B) QUALITY OF WOOL

    - F. REPRODUCTION

        - (1) FEMALE ANIMALS

            - (A) NUMBER OF OFFSPRING BORN
            - (B) SIZE OF OFFSPRING AT PARTURITION
            - (C) FREQUENCY OF CONCEPTION
            - (D) AGE REQUIRED TO REACH SEXUAL MATURITY

        - (2) MALE ANIMALS

            - (A) AGE REQUIRED TO REACH SEXUAL MATURITY
            - (B) SEXUAL DRIVE
            - (C) SEMEN QUALITY
            - (D) PHYSICAL HEALTH FOR MATING CAPACITY

    - G. OTHER PHYSICAL TRAITS

        - (1) RESISTANCE TO DISEASE
        - (2) RESISTANCE TO INSECTS
        - (3) ADAPTABILITY TO EXTREME WEATHER OR OTHER ENVIRONMENTAL CONDITIONS

2. DETERMINING SOME OF THE LAWS OF HEREDITY

A. DEFINITION OF COMMON TERMS

(1) HEREDITY
(2) ENVIRONMENT
(3) GENETICS
(4) CELL
(5) CHROMOSOME
(6) GENES
(7) HOMOLOGUES
(8) ALLELES
(9) MITOSIS
(10) HOMOZYGOUS
(11) HETEROZYGOUS
(12) DOMINANT
(13) RECESSIVE
(14) PHENOTYPE
(15) GENOTYPE

B. HEREDITY IN THE NUCLEUS OF BODY CELLS

(1) CHROMOSOMES FUNCTION AND NUMBER

(A) GENES - ARRANGEMENT
(B) GROWTH OF ANIMAL RELATIONSHIP (MITOSIS)
(C) WAY IN WHICH GENES CONTROL TRAITS

C. LAW OF GENE DOMINANCE OR RECESSITIVITY

(1) DOMINANT GENE ACTION
(2) RECESSIVE GENE ACTION
(3) DETERMINATION OF SINGLE PAIR OF GENES

D. DETERMINING THE SEX OF ANIMALS

(1) SEX CHROMOSOMES
(2) X OR Y CHROMOSOMES

E. LAW OF INCOMPLETE DOMINANCE

(1) HOMOZYGOUS TRAIT (EXAMPLE: COAT COLOR IN SHORTHORN CATTLE)
(2) HETEROZYGOUS TRAIT

F. LAW OF ADDITIVE GENE ACTION

(1) TYPE OF TRAIT AFFECTED

(A) MILK PRODUCTION IN DAIRY CATTLE
(B) RATE OF GAIN IN LIVESTOCK
(C) EXPLANATION OF HYBRID VIGOR

G. EPISTATIC GENE ACTION

(1) DEFINITION OF EPISTASIS
(2) ALBINO COLOR LIVESTOCK
(3) GENE ACTION CAUSING THE TRAIT

H. GENE MUTATIONS WHICH CAUSE ABNORMALITIES

(1) LETHALS (BULLDOG CALF)
(2) DWARFISM (CATTLE)
(3) HEMOPHILIA (SWINE)

I. SEX-LIMITED GENETIC ACTION (POULTRY)

3. DETERMINING GENETIC IMPROVEMENT TO BE EXPECTED FROM SELECTED PARENTS

A. CLASSIFYING HERITABILITY ESTIMATES

(1) LOW HERITABILITY (0-25%) - FERTILITY AND REPRODUCTIVE TRAITS
(2) MEDIUM HERITABILITY (25-50%) - PRODUCTIVE TRAITS SUCH AS RATE AND EFFICIENCY OF GAIN
(3) HIGH HERITABILITY (50% OR MORE) - CONFORMATION AND CARCASS TRAITS

B. APPLYING HERITABILITY ESTIMATES TO SELECTION OF MATES

(1) DETERMINING THE AVERAGE OF THE HERD OR GROUP OF ANIMALS FOR A SPECIFIC TRAIT
(2) DETERMINING THE AVERAGE SELECTION DIFFERENTIAL OF THE MALE AND FEMALE ANIMALS SELECTED FOR MATING
(3) CALCULATING THE EFFECT OF HERITABILITY ON THE OFFSPRING FROM THE SELECTED MATES

C. DETERMINING MEANS TO INCREASE THE SELECTION DIFFERENTIAL

(1) KEEPING PROPORTION OF FEMALE REPLACEMENTS LOW
(2) PLACING EMPHASIS ON THE SELECTION DIFFERENTIAL OF THE MALE

D. CALCULATING THE INFLUENCE ON GENETIC PROGRESS WHEN SELECTING FOR MORE THAN ONE TRAIT AT A TIME

(1) EXPECTED PERCENT DROP IN PROGRESS FOR INDIVIDUAL TRAITS WHEN USING MULTIPLE TRAIT SELECTION
(2) DETERMINING THE EFFECT OF POSITIVE AND NEGATIVELY CORRELATED TRAITS

E. USING THE GENERATION INTERVAL TO DETERMINE WHEN AVERAGE GENETIC PROGRESS SHOWS UP IN THE OFFSPRING

(1) EFFECT OF AGE AT SEXUAL MATURITY
(2) GESTATION INTERVALS
(3) MULTIPLE BIRTHS
(4) REPLACEMENT RATIOS OF BREEDING STOCK

4. IDENTIFYING THOSE SUPERIOR MALES TO BREED TO FEMALES

   A. SELECTION OF TRAITS NEEDING MOST IMPROVEMENT

   B. USE OF PRODUCTION TESTING DATA

   C. USE OF ARTIFICIAL BREEDING SERVICE CATALOG DATA

   D. SELECTING MALES THAT ARE KNOWN TO IMPROVE SPECIFIC TRAITS SELECTED FOR IMPORVEMENT

   E. ARRANGING TO BREED FEMALES TO SELECTED MALE OR MALES

      (1) ARTIFICIAL INSEMINATION TECHNICIAN
      (2) PURCHASE OF BREEDING MALE
      (3) RENTING BREEDING MALE
      (4) TRANSPORTING FEMALES TO LOCATION OF MALE

5. DETERMINING HOW TO CULL HERD OR FLOCK EFFECTIVELY

   A. IMPORTANCE OF A GOOD CULLING PROGRAM TO A BREEDING PROGRAM

      (1) GENETIC IMPROVEMENT OF TOTAL HERD OR FLOCK
      (2) MORE RAPID ECONOMIC GAINS

   B. DETERMINING TRAITS THAT HAVE ECONOMIC VALUE

   C. SETTING STANDARDS FOR CULLING TRAITS

      (1) SETTING REALISTIC STANDARDS FOR CULLING
      (2) LIMITING THE NUMBER OF TRAITS INCLUDED IN THE CULLING PROCESS

   D. PROVIDING FOR SUBSTANDARD PERFORMANCE IN ONE TRAIT TO BE OFFSET BY OUTSTANDING PERFORMANCE IN ANOTHER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. PROVIDE EACH STUDENT WITH EXAMPLES OF EITHER A BEEF OR DAIRY COW OF BREEDING AGE. POINT OUT TO THE STUDENT TWO HERITABLE TRAITS IN WHICH THOSE COWS ARE BELOW HERD AVERAGE. HAVE THE STUDENT SELECT FROM AN ARTIFICIAL INSEMINATION CATALOG THE BULL WHICH HE FEELS SHOULD BE MATED TO THE COW IN ORDER TO GAIN THE MOST IMPROVEMENT IN THESE SELECTED TRAITS. IF POSSIBLE, HAVE STUDENTS CALCULATE THE AMOUNT OF EXPECTED IMPROVEMENT FROM ENSUING OFFSPRING.

2. TAKE A FIELD TRIP TO SEVERAL FARMS IN THE AREA AND HAVE STUDENTS OBSERVE OR HAVE EXPLAINED TO THEM THE STANDARDS

USED FOR CULLING ON EACH FARM. HAVE THE STUDENTS DETERMINE THE PERCENT OF TOTAL HERD NUMBER USUALLY CULLED EACH YEAR BY THESE FARMS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. ASSIGN THE STUDENT THE TASK OF EVALUATING THOSE FEMALES OF BREEDING AGE ON HIS HOME FARM. HAVE HIM STATE IN WRITING:
   - A. THE HERD AVERAGE FOR THOSE TRAITS OF MOST ECONOMIC IMPORTANCE, SUCH AS, MILK PRODUCTION AND AVERAGE DAILY GAIN,
   - B. THOSE ANIMALS WHICH ARE BELOW THE HERD AVERAGE, AND
   - C. THE MALES WHICH HE RECOMMENDS TO BE MATED TO EACH OF THE BELOW-AVERAGE FEMALES AND REASONS WHY THEY SHOULD BE MATED.
2. AGAIN ON THE STUDENT'S HOME FARM, HAVE EACH STUDENT EXPLAIN WHICH FEMALES SHOULD BE CULLED AFTER EVALUATION AND THE REASONS FOR THE CHOICES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CURRENT ARTIFICIAL INSEMINATION BREEDERS CATALOGS
2. TRANSPARENCIES RELATED TO GENETICS AND BREEDING LIVESTOCK
3. CURRENT LITERATURE AND PERIODICALS PROVIDING INFORMATION ON GENETICS AND BREEDING

F. EXAMPLES OF SUPPORTING REFERENCES

1. ANIMAL BREEDING UNIT. COLUMBIA, MISSOURI: INSTRUCTIONAL MATERIALS LABORATORY, UNIVERSITY OF MISSOURI. 1971, 60 PAGES.

   THIS REFERENCE IS DEVELOPED FOR TEACHER USE AND INCLUDES STUDENT HANDOUTS AND TEN TRANSPARENCY MASTERS.

2. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 1061-1075.

   A CHAPTER ON GENETICS AND ANIMAL BREEDING IS INCLUDED IN THIS BOOK ALONG WITH MORE SPECIFIC INFORMATION ON

BREEDING WITHIN EACH SECTION DEALING WITH A PARTICULAR LIVESTOCK SPECIES.

3. MALONE, CHARLES A. SOURCE UNIT IN ANIMAL BREEDING. FORT COLLINS, COLORADO: AGRICULTURAL EDUCATION SECTION, COLORADO STATE UNIVERSITY. 1969, 31 PAGES.

   THIS SOURCE PROVIDES TEACHING PLANS FOR A UNIT IN ANIMAL BREEDING.

4. ROEDIGER, ROGER D. LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 194 PAGES.

   THIS SOURCE PROVIDES INFORMATION RELATING TO ALL PHASES OF LIVESTOCK BREEDING INCLUDING STUDENT ACTIVITIES AND EXERCISES. THE BOOK IS ILLUSTRATED AND EASILY READ. TRANSPARENCIES RELATING TO THE BOOK ARE ALSO AVAILABLE.

PREPARING THE FEMALE FOR BREEDING

UNIT CONCEPT: PROPER MANAGEMENT OF THE FEMALE OF ANY SPECIES OF LIVESTOCK BEFORE BREEDING HAS BEEN PROVEN TO INCREASE CONCEPTION RATE, PREVENT CONTRACTION OF DISEASES, AND REDUCE CHANCES OF INJURY TO BOTH MALE AND FEMALE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. GIVEN THE FEMALES OF THE ANIMALS FOUND ON THE FARM:
    - A. DESCRIBE THE PROCEDURES TO "FLUSH" THESE ANIMALS TO INSURE THAT THEY ARE IN GOOD BREEDING CONDITION PHYSICALLY AND PHYSIOLOGICALLY,
    - B. PREPARE THESE ANIMALS FOR BREEDING IN A WAY WHICH WILL PREVENT DISEASE TRANSMISSION, AND
    - C. PREPARE THESE ANIMALS FOR BREEDING IN A WAY WHICH WILL PREVENT INJURY TO BOTH THE MALE AND THE FEMALE.

B. INSTRUCTIONAL AREAS

1. DETERMINING HOW TO "FLUSH" THE FEMALE
    - A. DEFINITION OF FLUSHING
    - B. ADVANTAGES AND DISADVANTAGES OF FLUSHING
    - C. PROCEDURES TO USE ON EACH SPECIES OF LIVESTOCK
    - D. AMOUNTS TO FEED TO EACH SPECIES OF LIVESTOCK
2. IDENTIFYING THE IMPORTANCE OF EXERCISING FEMALES
    - A. IMPORTANCE TO CONCEPTION RATE
    - B. PROCEDURES TO FOLLOW IN PROVIDING ANIMAL WITH OPPORTUNITY TO EXERCISE
    - C. DANGERS OF TOO MUCH OR TOO LITTLE EXERCISE
3. DETERMINING PROCEDURES TO USE TO PREVENT DISEASE TRANSMISSION

A. CHECKING ANIMALS TO BE MATED FOR POSSIBLE DISEASE INFECTION

(1) BLOOD TEST
(2) TUBERCULOSIS TEST
(3) CULTURE TEST
(4) VETERINARIAN CHECK
(5) OTHER PROCEDURES

B. DISEASES WHICH ARE OF SPECIAL CONCERN IN REPRODUCTION

(1) VAGINITIS
(2) LEPTOSPRIOSIS
(3) BRUCELLOSIS
(4) VIBRIOSIS
(5) OTHER

C. PREVENTION OR TREATMENT MEASURES FOR DISEASES

(1) DEVELOP FOR THE DISEASES LISTED IN B.3.B
(2) USE OF ARTIFICIAL INSEMINATION

4. DETERMINING WHETHER TO SYNCHRONIZE ESTRUS OR NOT IN HERD OR FLOCK

A. VALUES OF SYNCHRONIZING ESTRUS

B. PROBLEMS INVOLVED WHEN SYNCHRONIZING ESTRUS

C. BENEFITS IF ESTRUS IS SYNCHRONIZED IN HERD OR FLOCK

D. PROBLEMS IF ESTRUS IS SYNCHRONIZED IN HERD OR FLOCK

5. IDENTIFYING PROCEDURES TO INSURE PROPER SANITATION AT BREEDING TIME

A. TAGGING EWES

B. WRAPPING MARE'S TAIL

C. WASHING MARE'S GENITAL ORGANS

D. ARTIFICIAL INSEMINATION SANITATION PROCEDURES

E. OTHER PROCEDURES

6. IDENTIFYING PROCEDURES TO PREVENT INJURY TO MALE OR FEMALE DURING BREEDING

A. FEMALES TAKEN TO MALES' QUARTERS

B. TEASING MARES

C. USE OF BREEDING CHUTE

(1) COWS
(2) SOWS
(3) OTHERS

D. HOBBLING AND TWITCHING MARES

C. EXAMPLES OF SUTDENT LEARNING ACTIVITIES

1. A. HAVE STUDENT FORMULATE A RATION WHICH WOULD MEET THE NUTRITION REQUIREMENTS FOR A GROUP OF FEMALES THAT IS TO BE "FLUSHED."

B. HAVE A VETERINARIAN DISCUSS WITH THE STUDENTS THOSE DISEASES TO GUARD AGAINST RELATED TO THE REPRODUCTIVE TRACT OF THE MALE AND FEMALE.

C. TAKE A FIELD TRIP TO A LOCAL FARM AND OBSERVE THE PROCEDURES USED TO PREVENT INJURY TO THE MARE AND STALLION DURING BREEDING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. WITH THE USE OF A PAPER AND PENCIL TEST, HAVE THE STUDENT DEFINE THE TERM "FLUSHING." TELL SPECIES OF LIVESTOCK FOR WHICH FLUSHING IS GENERALLY PRACTICED AND EXPLAIN THE PROCEDURES BY WHICH FLUSHING MAY BE ACCOMPLISHED FOR THESE ANIMALS.

B. HAVE THE STUDENT DEMONSTRATE THE PROPER PROCEDURES TO USE IN PREPARING A MARE FOR BREEDING, STARTING WITH THE PRACTICE OF TEASING THROUGH COPULATION. THIS MAY BE ACCOMPLISHED BY AN ACTUAL PERFORMANCE OF THESE SKILLS OR A PAPER AND PENCIL TEST, IF OPPORTUNITY FOR PERFORMANCE IS NOT AVAILABLE.

C. THE STUDENT WILL EXPLAIN IN WRITING THE IMPORTANCE OF USING A BREEDING CHUTE WHEN NATURAL BREEDING HEIFERS FOR THE FIRST TIME.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CLIPPER WITH SHEARING HEAD FOR TAGGING EWES

2. CHEESE CLOTH FOR WRAPPING MARE'S TAIL, HOBBLES AND TWITCH

3. PICTURES AND SLIDES TO ILLUSTRATE IN THE CLASSROOM

4. OVERHEAD PROJECTOR AND TRANSPARENCIES FOR USE IN CLASS DISCUSSIONS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. D. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1961, PP. 403, 686-687, 830-831, 1163-1164.

   THIS BOOK DEALS WITH THE TOPIC OF PREPARATION OF ALL FARM LIVESTOCK FOR BREEDING AND IS WRITTEN AT THE STUDENT LEVEL.

2. ENSMINGER, M. E. HORSES AND HORSEMANSHIP. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, PP. 259-263.

   THIS BOOK PROVIDES INFORMATION ON PREPARATION FOR BREEDING OF HORSES AND IS WRITTEN AT THE HIGH SCHOOL STUDENT LEVEL.

DETECTING PROPER TIME FOR BREEDING

UNIT CONCEPT: THERE IS A LIMITED PERIOD OF TIME, SEVERAL HOURS, DURING THE ESTRUS PERIOD WHEN BREEDING WILL RESULT IN MUCH HIGHER CONCEPTION RATES THAN IF BREEDING IS DONE SOONER OR LATER, EVEN THOUGH THE FEMALES ARE STILL IN THE ESTRUS PERIOD. WHEN ONLY A SINGLE MATING OR INSEMINATION IS USED DURING AN ESTRUS CYCLE, IT IS ESPECIALLY IMPORTANT THAT IT BE TIMED VERY PRECISELY TO COINCIDE WITH THE FERTILE PERIOD OF THE FEMALE BEING BRED IN ORDER TO ACHIEVE HIGH CONCEPTION RATES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR EACH TYPE OF LIVESTOCK COMMONLY PRODUCED IN THE AREA, DESCRIBE THE TYPICAL SIGNS OF HEAT (ESTRUS) OR APPROPRIATE METHODS FOR DETERMINING THE ONSET OF THE HEAT PERIOD OF THE FEMALES.

2. FOR EACH SPECIES OF LIVESTOCK COMMONLY PRODUCED IN THE AREA, DESCRIBE WHEN EACH SHOULD BE BRED DURING THE ESTRUS PERIOD IN ORDER TO INCREASE THE CHANCES OF A CONCEPTION.

3. DESCRIBE THE LENGTH AND REOCCURENCE OF ESTRUS FOR EACH SPECIES OF LIVESTOCK COMMON TO THE AREA SO AS TO BE ABLE TO KEEP A RECORD OF WHEN TO EXPECT THE NEXT ESTRUS IF PREGNANCY DOES NOT RESULT FROM A PREVIOUS BREEDING.

4. FROM A DIAGRAM, PHOTOGRAPH OR SPECIMEN OF LIVESTOCK, IDENTIFY THE DIFFERENT ORGANS THAT COMPRISE THE FEMALE REPRODUCTIVE TRACT AND EXPLAIN THE MAJOR FUNCTIONS OF EACH AS DESCRIBED BY A STANDARD REFERENCE ON THE SUBJECT.

5. DESCRIBE THE ESTRUS CYCLE IN THE FEMALE AND ITS RELATIONSHIP TO THE ONSET OF ESTRUS IN THE NORMALLY FUNCTIONING FEMALE.

6. LIST THE MAJOR HORMONES THAT REGULATE THE ESTRUS CYCLE AND STATE THEIR ORIGIN AND FUNCTION IN A NORMALLY FUNCTIONING FEMALE.

7. LIST SEVERAL METHODS THAT MAY BE EMPLOYED TO AID IN DETERMINING WHEN A NORMAL FEMALE WILL COME INTO HEAT OR IS ACTUALLY IN HEAT.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE IMPORTANCE OF DETECTING FEMALES IN HEAT AND BREEDING AT THE PROPER TIME OF ESTRUS

   A. ECONOMICS

   B. PHYSIOLOGICAL COMPLICATIONS

      (1) PROBLEM BREEDERS
      (2) DIFFICULTY OF ARTIFICIAL INSEMINATION

   C. OTHER IMPORTANT FACTORS

2. IDENTIFYING THE SYMPTOMS OF ESTRUS EXHIBITED BY THE FEMALES OF VARIOUS LIVESTOCK

   A. EARLY SYMPTOMS

   B. STANDING HEAT

   C. POST-ESTRUS SYMPTOMS

3. IDENTIFYING THE ORGANS THAT COMPRISE THE FEMALE REPRODUCTIVE TRACT

   A. OVARIES

   B. INFUNDIBULUM

   C. OVIDUCT

   D. UTERUS

   E. CERVIX

   F. VAGINA

   G. VULVA

   H. CLITORIS

*4. DETERMINING THE FUNCTION OF EACH ORGAN THAT COMPRISES THE FEMALE REPRODUCTIVE TRACT

* State the function for each of the organs listed in B.3.a through B.3.h.

5. IDENTIFYING THE ESTRUS CYCLE OF LIVESTOCK

   A. POLYESTRUS SPECIES

(1) OCCURRENCE OF ESTRUS CYCLE
(2) LENGTH OF ESTRUS CYCLE
(3) LENGTH OF ESTRUS
(4) RELATIONSHIP OF ESTRUS TO THE ESTRUS CYCLE

B. SEASONAL ESTRUS SPECIES

(1) OCCURRENCE OF ESTRUS CYCLE
(2) LENGTH OF ESTRUS CYCLE
(3) LENGTH OF ESTRUS
(4) RELATIONSHIP OF ESTRUS TO THE ESTRUS CYCLE

C. ESTRUS SYNCHRONIZATION PROCEDURES

(1) INJECTION
(2) ORAL
(3) IMPORTANCE OF FOLLOWING DIRECTIONS ON LABEL

6. DETERMINING THE RELATIONSHIP OF HORMONES TO THE PROPER FUNCTION OF THE REPRODUCTIVE TRACT OF THE NORMAL FEMALE

A. FOLLICLE-STIMULATING HORMONE (FSH)

(1) WHERE AND WHEN PRODUCED
(2) FUNCTION

B. LUTEINIZING HORMONE (LH)

(1) WHERE AND WHEN PRODUCED
(2) FUNCTION

C. ESTROGEN

(1) WHERE AND WHEN PRODUCED
(2) FUNCTION

D. PROGESTERONE

(1) WHERE AND WHEN PRODUCED
(2) FUNCTION

E. OXYTOCIN

(1) WHERE AND WHEN PRODUCED
(2) FUNCTION

F. OTHER HORMONES

(1) WHERE AND WHEN PRODUCED
(2) FUNCTION

7. DETERMINING WHEN TO BREED ANIMAL DURING ESTRUS PERIOD

A. EXPECTED TIME OF OVULATION

B. METHOD OF BREEDING

(1) NATURAL INSEMINATION

(A) PASTURE BREEDING
(B) HAND BREEDING

(2) ARTIFICIAL INSEMINATION

8. IDENTIFYING PROCEDURES THAT DETECT ANIMALS IN HEAT

A. GOOD RECORDS

B. REGULAR OBSERVATION

C. USE OF VASECTIMIZED MALE

D. USE OF HEAT DETECTION DEVICE

E. OTHER METHODS

9. IDENTIFYING PROBLEMS THAT ARE ASSOCIATED WITH THE FEMALE REPRODUCTIVE TRACT AND CONCEPTION

A. DEFINING THE PROBLEM

(1) NYMPHOMANIAC (CHRONIC BULLER) - CYSTIC OVARIES
(2) INFERTILITY
(3) OVERWEIGHT
(4) REPEAT BREEDERS

B. PROCEDURES TO CORRECT THE PROBLEM

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. PROVIDE THE STUDENT WITH A MARKING HARNESS FOR A RAM. SECURE THE HARNESS ONTO THE RAM IN PROPER FASION AND TURN HIM INTO A FLOCK OF BREEDING EWES. HAVE STUDENT CHECK AT LEAST EVERY DAY TO RECORD WHICH EWES HAVE BEEN BRED.

2. TAKE A TRIP TO A SLAUGHTER HOUSE AND OBSERVE SEVERAL FEMALE REPRODUCTIVE TRACTS. TRY TO DETERMINE THE STAGE OF THE ESTRUS CYCLE THAT EACH WAS IN. LOCATE A TRACT IN WHICH OVULATION HAD VERY RECENTLY OCCURRED.

3. HAVE EACH STUDENT MAKE A CHART CONTAINING THE IMPORTANT FACTS PERTAINING TO THE ESTRUS CYCLE FOR THE LIVESTOCK WITH WHICH HE IS WORKING. SUCH INFORMATION AS INTERVAL BETWEEN ESTRUS, LENGTH OF ESTRUS CYCLE, TIME OF OVULATION, WHEN TO BREED, AND WHEN TO CALL THE ARTIFICIAL INSEMINATOR SHOULD BE INCLUDED.

4. FROM A SLAUGHTER HOUSE, OBTAIN THE REPRODUCTIVE ORGANS OF A PREGNANT ANIMAL. OPEN UP THIS TRACT AND HAVE THE STUDENTS NOTE PARTICULARLY THE MUCOUS PLUG IN THE CERVIX, THE UTERUS AND DEVELOPING FETUS, AND THE OVARIES. CHECK ALL OF THE ORGANS TO SEE IF THEY WERE FUNCTIONING PROPERLY DURING THIS PREGNANCY.

5. HAVE THE STUDENTS PREPARE A FLOW DIAGRAM SHOWING AND EXPLAINING THE RELATIONSHIP OF ESTRUS TO THE ESTRUS CYCLE. THIS DIAGRAM WOULD INCLUDE THE KEY HORMONES RESPONSIBLE FOR THIS PROCESS.

6. HAVE THE STUDENTS MAKE A CHART OF THE MAJOR HORMONES INFLUENCING THE ESTRUS CYCLE. INCLUDE SUCH INFORMATION AS SOURCE, TARGET, FUNCTION, WHEN SECRETED AND FACTORS INHIBITING SECRETION.

7. ASSIGN EACH STUDENT OR GROUP OF STUDENTS TO RESEARCH (TEXT BOOKS OR PERIODICALS) ON A PARTICULAR METHOD OR PROCEDURE USED TO AID IN DETERMINING WHEN FEMALES ARE IN HEAT. SOME COMMON METHODS TO EXPLORE WOULD BE THE USE OF HEAT DETECTION DEVICES, VASECTIMIZED MALES, TEASING MARES OR CLOSED CIRCUIT TELEVISION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. STUDENT SHOULD EXHIBIT HIS ABILITY TO IDENTIFY THOSE FEMALES OF A SPECIFIC SPECIES OF LIVESTOCK THAT ARE IN ESTRUS. THE STUDENT MAY EXPLAIN THE PRINCIPLE OF WHY VASECTIMIZED RAMS ARE NECESSARY TO DETECT EWES IN HEAT.

2. HAVE THE STUDENT EXPLAIN IN WRITING THE BEST TIME TO BREED A DAIRY COW AFTER SHE COMES INTO HEAT.

3. HAVE THE STUDENT EXPLAIN IN WRITING THE RECORDS HE WOULD KEEP IN ORDER TO ASSURE BREEDING DURING THE NEXT HEAT PERIOD OF AN EWE HE MISSED BREEDING DURING THE LAST HEAT PERIOD.

4. PROVIDE THE STUDENT WITH A BLANK DIAGRAM OF THE COW'S REPRODUCTIVE TRACT. HAVE EACH STUDENT NAME EACH ORGAN OF THE TRACT CORRECTLY AND EXPLAIN THE MAJOR FUNCTION OF EACH.

5. EVALUATE THE FLOW DIAGRAM ASSIGNED TO EACH STUDENT OR GROUP OF STUDENTS. CHECK FOR ACCURACY - THE RIGHT HORMONE CAUSING THE RIGHT REACTION, AND SO ON.

6. HAVE THE STUDENT EXPLAIN WHAT HAPPENS TO THE ESTRUS CYCLE OF A FEMALE WHICH TENDS TO EXHIBIT CONSTANT SIGNS OF HEAT CAUSED BY A CYSTIC OVARY AND CALLED NYMPHOMANIA.

7. HAVE THE STUDENT DEMONSTRATE THE PROPER PROCEDURE FOR PLACING A HEAT DETECTION DEVICE ON A COW.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PICTURES AND DIAGRAMS OF FEMALE REPRODUCTIVE TRACTS
2. OVERHEAD PROJECTOR
3. DISSECTING KITS FOR REPRODUCTIVE TRACT EXAMINATION
4. FORMALDEHYDE FOR PRESERVING REPRODUCTIVE TRACTS FOR FUTURE USE
5. POSTER BOARD AND MAGIC MARKERS FOR MAKING VARIOUS CHARTS
6. LOW-EDGED PANS IN WHICH TO DO DISSECTION WORK
7. PROPER CONTAINERS TO DISCARD ORGANS IF NOT WANTED FOR FUTURE USE. NOTE: CHECK TO SEE WHAT PROCEDURES MUST BE FOLLOWED WHEN DISCARDING REPRODUCTIVE TRACTS TO BE WITHIN HEALTH STANDARDS.

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

   THIS BOOK PROVIDES A CHAPTER THAT DEALS SPECIFICALLY WITH BREEDING LIVESTOCK. IN SEPARATE CHAPTERS, IT DEALS WITH MORE SPECIFIC INFORMATION ON BREEDING AS IT PERTAINS TO EACH SPECIES.

2. MALONE, CHARLES A. SOURCE UNIT IN ANIMAL BREEDING. FORT COLLINS, COLORADO: AGRICULTURAL EDUCATION SECTION, COLORADO STATE UNIVERSITY. 1969, 31 PAGES.

   THIS PUBLICATION PROVIDES STUDY GUIDES AND ILLUSTRATIONS SUITABLE FOR MAKING TRANSPARENCIES DEALING WITH THE TOPIC OF ANIMAL BREEDING.

3. ROEDIGER, ROGER D. LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 194 PAGES.

   THIS SOURCE PROVIDES DISCUSSION ALONG WITH ILLUSTRATIONS OF THE FEMALE REPRODUCTIVE ORGANS, HORMONES OR REPRODUCTION, AND HEAT DETECTION. DIAGRAMS FROM WHICH TRANSPARENCIES ON ALL ASPECTS OF LIVESTOCK BREEDING MAY BE MADE ARE ALSO AVAILABLE.

ARTIFICIAL BREEDING

UNIT CONCEPT: ARTIFICIAL BREEDING IS A TECHNIQUE THAT IS WIDELY USED WITH LIVESTOCK TODAY, PARTICULARLY IN THE CATTLE INDUSTRY, IN AN EFFORT TO INCREASE BREEDING EFFICIENCY, CONTROL CERTAIN DISEASES AND INCREASE THE UTILITY OF OUTSTANDING SIRES. THE LIVESTOCK PRODUCER MUST BE ABLE TO DETERMINE WHEN THIS PROCESS IS DESIRABLE AND THEN FOLLOW THOSE TECHNIQUES WHICH WILL INSURE MAXIMUM CONCEPTION RATES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR A GIVEN SPECIES OF LIVESTOCK, DESCRIBE THE ADVANTAGES AND DISADVANTAGES OF THE USE OF SIRES BY ARTIFICIAL INSEMINATION COMPARED TO THE USE OF SIRES BY NATURAL MATING ON THE FOLLOWING ITEMS.:
    A. COST OF OWNING A SIRE VERSUS PURCHASING SEMEN,
    B. GENETIC IMPROVEMENT,
    C. SAFETY AND DISEASE CONTROL,
    D. LABOR INVOLVED AND CONVENIENCE,
    E. FACILITIES,
    F. FAILURE IN HEAT DETECTION,
    G. CONCEPTION RESULTS, AND
    H. BREED ASSOCIATION REGISTRATION REQUIREMENTS OF OFFSPRING.
2. GIVEN THE PRODUCTION PERFORMANCE AND PHYSICAL TRAITS AND CHARACTERISTICS NEEDING IMPROVEMENT FOR A SPECIFIC HERD OR FLOCK, SELECT THE SIRE(S) MOST DESIRABLE FOR ACHIEVING IMPROVEMENT BASED UPON PRODUCTION PERFORMANCE RECORDS AND TYPE CHARACTERISTICS OF AVAILABLE SIRES.
3. GIVEN FEMALES MATURE ENOUGH FOR BREEDING, DETERMINE THE BEST TIME FOR INSEMINATION BY RECOGNIZING ESTRUS SIGNS AND DETERMINE WHEN THE INSEMINATOR SHOULD BE CONTACTED TO INSURE MAXIMUM LEVEL OF CONCEPTION.

4. GIVEN FEMALES READY FOR BREEDING, DEMONSTRATE THE ABILITY TO IDENTIFY, RESTRAIN AND PREPARE THE ANIMAL FOR INSEMINATION.

5. GIVEN THE BREEDING FEMALE ANIMALS OF A CERTAIN SPECIES, DEFINE PRACTICES WHICH WILL REGULATE THE TIME WHEN THOSE FEMALES WILL COME INTO ESTRUS AND DESCRIBE THE PROCEDURES TO FOLLOW TO SYNCHRONIZE THE ESTRUS OF THAT GROUP OF FEMALES SO THAT INSEMINATION CAN BE DONE WITH THE GROUP RATHER THAN INDIVIDUALLY.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE BENEFITS OF ARTIFICIAL BREEDING
    A. CALCULATING COST OF OWNING A SIRE VERSUS COST OF ARTIFICIAL INSEMINATION
    B. DEFINING THE ACCESS TO OUTSTANDING SIRES THROUGH ARTIFICIAL INSEMINATION
    C. ILLUSTRATING THE EFFECT OF CLOSING THE HERD TO REPRODUCTIVE DISEASES BY USE OF ARTIFICIAL INSEMINATION
    D. RECOGNIZING THE SAFETY HAZARDS ELIMINATED BY ARTIFICIAL INSEMINATION
2. DETERMINING THE LIMITATIONS TO THE PRODUCER
    A. RECOGNIZING THE EXTRA MANAGEMENT REQUIRED FOR HEAT DETECTION AND TIMING OF INSEMINATION WITH ARTIFICIAL INSEMINATION
    B. KEEPING CHARACTERISTICS OF SEMEN FROM SWINE
    C. RECOGNIZING THE EXTRA LABOR INVOLVED IN INSEMINATING RANGE CATTLE AND SHEEP WITH ARTIFICIAL INSEMINATION
    D. REGISTRATION RESTRICTIONS ON SOME ARTIFICIALLY INSEMINATED OFFSPRING
3. SELECTING SIRES FOR BREEDING TO HERD
    A. DETERMINING DESIRED CHARACTERISTICS OF OFFSPRING
    B. DETERMINING PRODUCTION PERFORMANCE AND PHYSICAL TRAITS OR CHARACTERISTICS NEEDING IMPROVEMENT IN OFFSPRING
    C. ACQUIRING INFORMATION ABOUT SIRES FROM BREEDING SERVICES

D. DETERMINING SIRE(S) WITH TRAITS WHICH WILL AID IN HERD IMPROVEMENT

E. DETERMINING EFFECT OF SIRE AND PROGENY PERFORMANCE ON FUTURE OFFSPRING

F. DETERMINING FEASIBILITY OF USING VARIOUS SIRES BASED ON COST OF SEMEN AND EXPECTED OFFSPRING IMPROVEMENT

G. DETERMINING AND PLANNING FOR THE AVAILABILITY OF SEMEN FROM DESIRED SIRES

4. DETERMINING TIME FOR INSEMINATION

A. DETERMINING THE AGE OR SEASON TO EXPECT ESTROUS PERIODS IN VARIOUS CLASSES OF LIVESTOCK

B. DETECTING EARLY SIGNS OF ESTRUS (PROESTRUS) BY OBSERVING PHYSICAL ACTIVITY AND NOTICEABLE CHANGES IN REPRODUCTIVE SYSTEM

C. OBSERVING EXTERNAL SIGNS OF ESTRUS

D. DETERMINING DURATION OF ESTROUS CYCLE FOR VARIOUS LIVESTOCK CLASSES

E. DETERMINING EXPECTED TIME OF OVULATION AND TIME MOST APPROPRIATE FOR INSEMINATION

(1) NATURAL PHYSIOLOGICAL OCCURENCE OF OVULATION
(2) PALPATION - PROBLEM BREEDERS

F. CONTACTING INSEMINATOR AT FIRST SIGNS OF ESTRUS TO INFORM WHEN SERVICES ARE NEEDED

G. USING AIDS FOR HEAT DETECTION

(1) (GOMER) - ALTERED BULL
(2) DYE MARKER

5. PREPARING FEMALE AND FACILITIES FOR THE INSEMINATION PROCESS

A. PROVIDING CLEAN AND SANITARY AREA FOR INSEMINATION PROCESS

B. EXAMINING FEMALES TO INSURE ABSENCE OF DISEASE

C. RESTRAINING ANIMALS FOR INSEMINATION

6. SYNCHRONIZING ESTRUS FOR INSEMINATION

A. DETERMINING VALUE OF SYNCHRONIZATION FOR ARTIFICIAL INSEMINATION PURPOSES

B. DETERMINING HORMONE MATERIALS TO USE TO SYNCHRONIZE

C. MIXING AND PREPARATION PROCEDURES FOR HORMONE MATERIALS

D. DETERMINING TIME AND PROCESS FOR BEGINNING FEEDING OR INJECTING OF MATERIALS BY CONSIDERING DESIRED OFFSPRING BIRTH AND SUBSEQUENT USE

7. IDENTIFYING THE PROCESSES INVOLVED IN COLLECTING, HANDLING AND STORAGE OF SEMEN

A. SEMEN-COLLECTING PROCEDURES

(1) STALLION
(2) BULL
(3) RAM
(4) ROOSTER
(5) BOAR

B. HANDLING FRESHLY COLLECTED SEMEN

(1) CHECKING FOR MOTILITY AND MORPHOLOGY
(2) EXTENDING SEMEN
(3) FREEZING SEMEN
(4) STORING SEMEN

C. STORING FROZEN SEMEN IN INSULATED CANISTER

(1) TEMPERATURE FOR PROPER STORAGE
(2) KEEPING LIQUID NITROGEN SUPPLY ADEQUATE IN SEMEN STORAGE TANK
(3) PROCEDURES WHEN REMOVING SEMEN FROM STORAGE TANK FOR ARTIFICIAL INSEMINATION USE

    (A) PREVENTING SEMEN SHOCK
    (B) BREAKING VIAL OR STOCK PROPERLY
    (C) PROPER SEMEN REMOVAL FROM VIAL OR STICK INTO INSEMINATOR DECATHATOR

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. GIVE THE CLASS A CASE SITUATION DEALING WITH A LIVESTOCK BREEDING PROGRAM WHERE THE SPECIFIC NUMBER OF FEMALE LIVESTOCK IS DEFINED. USE A CLASS MEMBER'S HOME LIVESTOCK PROGRAM OR THAT OF A PRODUCER IN THE SCHOOL COMMUNITY. HAVE CLASS MEMBERS RESEARCH AND COMPARE THE COSTS OF SIRE OWNERSHIP AND ARTIFICIAL INSEMINATION FOR

THE CASE STUDY. HAVE INDIVIDUAL CLASS MEMBERS REPORT ON ASPECTS OF SAFETY, LABOR AND CONVENIENCE AND HEAT DETECTION FOR EACH OF THE METHODS.

B. VISIT A BREEDING SERVICE IF IN THE AREA AND HAVE STUDENTS OBSERVE COLLECTION, PROCESSING AND STORING OF SEMEN AND HAVE GROUPS PREPARE CLASS PRESENTATIONS ON EACH OF THE PROCESSES.

2. HAVE STUDENTS STUDY RECORDS OF SIRES AVAILABLE FROM BREEDING SERVICES TO DETERMINE SIRES MOST APPROPRIATE TO USE FOR A GIVEN GROUP OF ANIMALS. STUDENTS SHOULD STUDY SIRES' PREDICTED DIFFERENCES, PROGENY PRODUCTION, HERDMATE COMPARISONS AND THEN DETERMINE HOW THESE FACTORS MAY AFFECT FUTURE OFFSPRING.

3. USING ACTUAL ANIMALS OR APPROPRIATE VISUAL AIDS, HAVE STUDENTS OBSERVE THE HEAT CYCLE AND DETERMINE TIME OF OVULATION FOR EACH CLASS OF LIVESTOCK, AND THEN MAKE A CHART INDICATING WHEN THE INSEMINATOR SHOULD BE CONTACTED.

4. A. IF POSSIBLE, VISIT A FARM WHEN INSEMINATION IS BEING DONE; THEN HAVE STUDENTS DETERMINE THE ADVANTAGES AND DISADVANTAGES OF THIS TYPE OF BREEDING TECHNIQUE.

   B. HAVE THE LOCAL INSEMINATOR SPEAK TO CLASS ABOUT THE BASIC TECHNIQUES OF ARTIFICIAL INSEMINATION AND WHAT THE LIVESTOCK PRODUCER CAN DO TO SEE THAT THE ANIMALS ARE PREPARED FOR INSEMINATION.

5. OBTAIN THE LABEL FROM A HEAT-SYNCHRONIZING FEED ADDITIVE AND STUDY THE PROGRAM WHICH WOULD NEED TO BE FOLLOWED WITH ITS USE. HAVE STUDENTS DEVELOP A PLAN TO FOLLOW WHEN USING THE ADDITIVE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A PAPER AND PENCIL TEST OF THE ADVANTAGES AND DISADVANTAGES OF NATURAL BREEDING AND ARTIFICIAL INSEMINATION WILL BE COMPLETED TO THE SATISFACTION OF THE INSTRUCTOR OVER ITEMS OF COMPARISON CONSISTING OF: COST, FACILITIES, CONVENIENCE, SAFETY AND DISEASE AND ABILITY TO DETECT FEMALES IN HEAT AND CONCEPTION RATES.

2. GIVEN APPROPRIATE REFERENCES AND AVAILABLE SIRES, THE STUDENT WILL ANALYZE THE INFORMATION AND SELECT THE SIRE(S) MOST DESIRABLE FOR IMPROVING IDENTIFIED TRAITS AND CHACTERISTICS OF FEMALES.

3. GIVEN FEMALE LIVESTOCK IN HEAT, THE STUDENT WILL DETERMINE WHEN ANIMALS ARE IN THE FIRST STAGES OF ESTRUS AND WILL DETERMINE WHEN THE INSEMINATOR SHOULD BE CONTACTED.

4. GIVEN ANIMALS READY FOR INSEMINATION, THE STUDENT WILL IDENTIFY, RESTRAIN AND PREPARE THE ANIMALS FOR THE INSEMINATION PROCESS TO THE SATISFACTION OF THE INSEMINATOR.

5. BY REFERRING TO THE FEEDING INSTRUCTIONS FROM A HEAT SYNCHRONIZING FEED ADDITIVE, THE STUDENT CAN COMPLETE, TO THE SATISFACTION OF THE INSTRUCTOR, A WRITTEN PLAN OF THE AMOUNTS OF FEED ADDITIVES AND ALL OTHER TYPES OF FEED AND THE FEEDING SCHEDULE TO BE FOLLOWED FOR A GIVEN NUMBER OF LIVESTOCK TO COME INTO HEAT ON A SPECIFIC DATE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SIRE PRODUCTION PERFORMANCE RECORDS FROM BREEDING SERVICES, CURRENT CATALOG OF SIRES OFFERED FOR USE

2. CHARTS, SLIDES OR OTHER REFERENCES ILLUSTRATING HEAT CYCLE AND OVULATION IN VARIOUS LIVESTOCK CLASSES

3. SEMEN COLLECTING AND INSEMINATION EQUIPMENT FOR INCREASED STUDENT UNDERSTANDING OF THESE PROCESSES

4. FEMALE LIVESTOCK ANIMALS IN ESTRUS

5. SAMPLES OF HORMONE MATERIALS USED IN SYNCHRONIZATION WITH LABELS OF THE FEEDING DIRECTIONS

F. EXAMPLES OF SUPPROTING REFERENCES

1. ARTIFICIALLY INSEMINATING LIVESTOCK. VAS 1002B. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1972, 12 PAGES.

   THIS STUDENT REFERENCE PROVIDES INFORMATION ON ADVANTAGES AND DISADVANTAGES OF ARTIFICIAL INSEMINATION, THE REPRODUCTIVE ORGANS OF MAMMALS, HOW SPERM ARE COLLECTED AND STORED, HOW FEMALES ARE ARTIFICIALLY INSEMINATED, AND BREEDING ORGANIZATIONS.

2. ROEDIGER, ROGER D. LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 194 PAGES.

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THIS REFERENCE IS A SOURCE OF INFORMATION AND ILLUSTRATIONS ON SUCH TOPICS AS THE REPRODUCTIVE ORGANS, WHEN TO BREED THE FEMALES, NUMBER OF INSEMINATIONS PER MALE AND SYNCHRONIZING OF ESTRUS.

THE DEVELOPING FETUS

UNIT CONCEPT: PRIOR TO BIRTH TREMENDOUS DEVELOPMENT TAKES PLACE IN THE UTERUS OF THE FEMALE PARENT. THE ANIMAL BREEDER CAN DO A BETTER JOB IN MANAGING THIS PREGNANT FEMALE IF HE UNDERSTANDS THE VARIOUS PROCESSES THAT GO ON BETWEEN MOTHER AND FETUS DURING ITS DEVELOPMENT INCLUDING PARTURITION AND POSTPARTURITION PERIODS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN AN EXAMPLE OF A PREGNANT FEMALE OF A CERTAIN ANIMAL SPECIES:

    A. DESCRIBE ON A DIAGRAM THE PATH THAT THE DEVELOPING EMBRYO TAKES IN THE REPRODUCTIVE TRACT AND WHERE IT LOCATES PERMANENTLY TO INSURE THE NORMAL DEVELOPMENT OF THAT SPECIES,

    B. DESCRIBE THE DEVELOPMENT STAGES OF THAT OFFSPRING FROM FERTILIZATION TO PARTURITION AS DEFINED BY A STANDARD REFERENCE ON THE SUBJECT,

    C. EXPLAIN THE METHOD BY WHICH THE DEVELOPING OFFSPRING IS NOURISHED AND HOW REMOVAL OF WASTE MATERIALS IS ACCOMPLISHED TO INSURE NORMAL DEVELOPMENT, AND

    D. DETERMINE FROM DATA THE EXPECTED LENGTH OF THE GESTATION PERIOD NECESSARY FOR NORMAL DEVELOPMENT OF THAT OFFSPRING.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE PATHWAY OF THE EMBRYO IN THE REPRODUCTIVE TRACT

    A. POINT OF FERTILIZATION

    B. MIGRATION TO UTERUS

        (1) TIME INVOLVED
        (2) NOURISHMENT OF EMBRYO
        (3) DEVELOPMENT OF EMBRYO

2. IDENTIFYING THE LIFELINE HOOK-UP BETWEEN MOTHER AND EMBRYO IN THE UTERUS
    - A. FETAL MEMBRANES OR PLACENTA
        - (1) WHEN DEVELOPED
        - (2) PURPOSES OF FETAL MEMBRANES
        - (3) COMPONENTS
            - (A) SACS OR FETAL AND UTERINE MEMBRANES
            - (B) FLUID
            - (C) COTYLEDONS OF PLACENTA
            - (D) CARUNCLES OF UTERUS
            - (E) UMBILICAL CORD
        - (4) NOURISHMENT - WASTE REMOVAL PROCESS OF FETAL MEMBRANES
3. IDENTIFYING HOW THE ESTRUS CYCLE IS INFLUENCED BY PREGNANCY IN THE FEMALE
    - A. CESSATION OF ESTRUS
        - (1) FUNCTION OF OVARY
            - (A) CORPUS LUTEUM
            - (B) PROGESTERONE
    - B. ABNORMAL ESTRUS DURING PREGNANCY
        - (1) POSSIBLE CAUSE
        - (2) CONSEQUENCES IF PREGNANT FEMALE BRED
            - (A) NATURALLY
            - (B) ARTIFICIALLY
        - (3) PROPER PROCEDURES TO FOLLOW IF THIS EVENT OCCURS
4. PROBLEMS THAT MIGHT OCCUR DURING PREGNANCY
    - A. REABSORPTION OF EMBRYO - SWINE
    - B. ABORTION
    - C. PRE-MATURE BIRTH
5. DETERMINING THE STAGES OF OFFSPRING DEVELOPMENT IN THE UTERUS FROM FERTILIZATION OF OVUM TO BIRTH

A. EXAMPLE OF TIME TABLE FOR DEVELOPING DAIRY CALF

TIME-DAYS	DEVELOPMENT
0	FERTILIZATION IN OVIDUCT
4	8-16 CELL STAGE - REACHES UTERUS
12	ZYGOTE FORMS WEAK ATTACHMENT TO UTERINE WALL
18	AMNION (WATER SAC) ENCLOSES EMBRYO
21	HEART BEGINS TO BEAT, REPRODUCTIVE TRACT BEGINS DEVELOPING
23	HEAD REGION RECOGNIZABLE
25	FORELIMB BUDS APPEAR
30	FIRST PLACENTAL PLATES APPEAR
33	FRAGILE COTYLEDONARY ATTACHMENT
37	FACIAL FESTURES APPEAR
46	NOW CALLED A FETUS
60	EYLIDS CLOSE
100	HORN PITS APPEAR
110	HAIR COVERING BODY
280	BIRTH

B. EXAMPLES OF OTHER ANIMAL SPECIES OFFSPRING DEVELOPMENT

6. IDENTIFYING THE LENGTH OF GESTATION FOR THE VARIOUS SPECIES OF LIVESTOCK

   A. AVERAGE LENGTH

   B. RANGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENT EXAMINE THE REPRODUCTIVE TRACT OF A FEMALE AND DIAGRAM THIS TRACT IN HIS NOTEBOOK. THE TRACT SHOULD THEN BE OPENED UP TO EXAMINE THE INNER LINING. PARTICULAR ATTENTION SHOULD BE GIVEN TO THE OVIDUCT AND ITS FUNCTION OF GETTING THE EMBRYO TO THE UTERUS. (RUBBER GLOVES SHOULD BE WORN TO AVOID POSSIBLE INFECTION FROM HAND CONTACT WITH THESE TISSUES.)

   B. HAVE THE STUDENT INCUBATE SOME FERTILE EGGS OF CHICKENS. EVERY THREE DAYS, BREAK AND OPEN AN EGG AND COMPARE OBSERVED DEVELOPMENT WITH THAT OF A STANDARD REFERENCE ON THE TOPIC.

C. PROVIDE THE STUDENT WITH THE FETUS AND FETAL MEMBRANES FROM A BUTCHERED PREGNANT FEMALE. HAVE THE STUDENT EXAMINE THE CARUNCLES-COTYLEDON CONNECTION BETWEEN THE MOTHER AND OFFSPRING AND DIAGRAM THIS SYSTEM IN HIS NOTEBOOK. NOTE DIFFERENCES BETWEEN SPECIES FOR FIRMNESS AND PATTERN OF CONNECTION BETWEEN UTERUS AND PLACENTA.

D. HAVE THE STUDENTS LOOK UP AND LIST THE AVERAGE GESTATION PERIODS FOR DOGS, CATS, HORSES AND CATTLE. ALSO, HAVE THEM NOTE THE RANGE IN TIME WHICH CAN BE EXPECTED FOR EACH SPECIES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. IN A PAPER AND PENCIL TEST, HAVE THE STUDENT EXPLAIN THE ROUTE THAT THE BOVINE EMBRYO TAKES AND ITS DEVELOPMENT AS IT GOES ALONG THIS ROUTE UNTIL IT REACHES THE UTERUS.

B. HAVE THE STUDENT EXPLAIN THE STAGES OF DEVELOPMENT OF THE EMBRYO CHICKEN WHILE IN THE EGG. USE OF A MULTIPLE CHOICE-TYPE QUESTION WOULD BE AN APPROPRIATE WAY TO TEST THE DEGREE OF RECALL EXPECTED.

C. HAVE THE STUDENT SELECT A SPECIES OF ANIMAL OF HIS CHOICE AND EXPLAIN HOW THAT ANIMAL IS NOURISHED AND HOW WASTE MATERIAL IS REMOVED WHILE IN THE EMBRYONIC OR FETAL STAGE OF GESTATION.

D. HAVE THE STUDENT LIST IN WRITING THE RANGE IN TIME OF THE GESTATION PERIODS FOR ANIMALS THAT HE HAS DIRECT CONTACT WITH AT HOME, AT WORK OR AT SCHOOL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PREGNANT AND NONPREGNANT FEMALE REPRODUCTIVE TRACTS
2. CHICKEN INCUBATOR AND FERTILE EGGS
3. OVERHEAD PROJECTOR AND TRANSPARENCIES APPROPRIATE TO SUBJECT
4. SUITABLE CONTAINERS TO HOLD REPRODUCTIVE TRACTS
5. LARGE DISSECTION TABLE OR SUITABLE PAN FOR EXAMINING REPRODUCTIVE TRACTS
6. FORMALIN FOR STORING REPRODUCTIVE TRACTS WHEN NOT IN USE

7. SURGICAL SCISSORS AND OTHER DISSECTION TOOLS - DISSECTION KITS

8. DIAGRAMS OF THE STAGES OF GESTATION FOR SEVERAL SPECIES OF ANIMALS

9. RUBBER GLOVES

F. EXAMPLES OF SUPPORTING REFERENCES

1. ACKER, DUANE. ANIMAL SCIENCE AND INDUSTRY. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1971, PP. 211-220.

   THIS STUDENT REFERENCE DISCUSSES THE PROCESSES OF GESTATION WITH ILLUSTRATIONS OF FARM LIVESTOCK.

2. ROEDIGER, ROGER D. LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, PP. 75-79.

   THIS STUDENT REFERENCE PROVIDES INFORMATION AND ILLUSTRATIONS ON THE PROCESSES AFFILIATED WITH ANIMAL GESTATION.

CARE OF FEMALE DURING GESTATION

UNIT CONCEPT: TO INSURE NORMAL, HEALTHY OFFSPRING, THE GESTATING FEMALE SHOULD BE PROVIDED WITH THE PROPER FEED, WATER, SHELTER AND OPPORTUNITY TO EXERCISE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A GESTATING FEMALE OF A CERTAIN SPECIES OF ANIMAL:

   A. DETERMINE THE RATION THAT WILL MEET THE NUTRITIONAL NEEDS OF THAT FEMALE AND THE DEVELOPING FETUS ACCORDING TO AN APPROVED NUTRITIONAL REFERENCE SUCH AS MORRISON'S FEEDING STANDARDS.

   B. DETERMINE THE TYPE OF SHELTER THAT SHOULD BE PROVIDED FOR THE FEMALE TO INSURE ADEQUATE PROTECTION DURING INCLEMENT WEATHER OR OTHER ADVERSE CONDITIONS.

   C. DETERMINE THE EXTRA CARE AND MANAGEMENT THAT SHOULD BE PROVIDED AS THE FEMALE APPROACHES PARTURITION IN ORDER TO INCREASE THE CHANCES OF THE SURVIVAL OF BOTH MOTHER AND OFFSPRING.

B. INSTRUCTIONAL AREAS

1. DETERMINING THOSE PRACTICES ASSOCIATED WITH PROPER NUTRITION AND FEEDING OF THE GESTATING FEMALE

   A. BALANCED RATION

      (1) FEMALE'S REQUIREMENTS
      (2) FETUS' REQUIREMENTS

   B. WATER REQUIREMENTS

      (1) AMOUNT
      (2) CLEANLINESS

   C. METHODS OF FEEDING

      (1) PASTURE AND SUPPLEMENT
      (2) CONFINEMENT AND SUPPLEMENT
      (3) USE OF LIQUID SUPPLEMENT

D. SMALL ANIMALS

(1) LABORATORY
(2) PETS
(3) OTHERS

2. IDENTIFYING THE TYPE OF SHELTER THAT SHOULD BE PROVIDED FOR THE GESTATING FEMALE

A. USE OF NATURAL SHELTER

(1) PINE GROVE
(2) WOODED AREAS
(3) GEOGRAPHICAL CONTOURS - DRAWS, CLIFFS
(4) ADVANTAGES AND DISADVANTAGES OF USE OF DIFFERENT NATURAL SHELTERS

B. USE OF CONSTRUCTED SHELTERS

(1) ENCLOSED BUILDINGS OR CAGES
(2) THREE-SIDED BUILDINGS
(3) WIND BREAKS
(4) SUN SHELTERS
(5) ADVANTAGES AND DISADVANTAGES OF EACH OF THE CONSTRUCTED SHELTERS

3. DETERMINING HOW TO INSURE THAT THE GESTATING FEMALES RECEIVE ENOUGH EXERCISE

A. USE OF PASTURE OR RANGE

(1) FEEDING PROCEDURES
(2) LOCATION OF SALT BOX OR LICK

B. CONFINEMENT - PADDOCK OR CAGE

(1) FEEDING PROCEDURES
(2) LOCATION OF MINERALS OR SALT BOS OR LICK
(3) FORCED EXERCISE
(4) PRECAUTIONS AND CARE WHEN HANDLING PREGNANT ANIMALS TO PREVETN INJURIES TO FETUS

C. ADVANTAGES AND DISADVANTAGES OF PASTURE OR RANGE METHOD OF PROVIDING EXERCISE TO GESTATING FEMALE

D. ADVANTAGES AND IDSADVANTAGES OF CONFINEMENT FOR PROVIDING EXERCISE FOR THE GESTATING FEMALE

4. IDENTIFYING ENVIRONMENTAL CONDITIONS THAT CAUSE UNDUE STRESS IN THE GESTATING FEMALE
    - A. TEMPERATURE EXTREMES
    - B. EXCITEMENT STIMULANTS
    - C. UNSAFE CONDITIONS
    - D. OTHER CONDITIONS

5. IDENTIFYING THE EXTRA CARE AND MANAGERIAL PRACTICES THAT SHOULD BE PROVIDED AS THE GESTATING FEMALE APPROACHES PARTURITION
    - A. COLD WEATHER CONDITIONS
        - (1) UNDER-COVER PROTECTION PROVIDED
            - (A) THREE-SIDED BUILDING
                - 1. BEDDING REQUIREMENTS
                - 2. VENTILATION REQUIREMENTS
            - (B) ENCLOSED BUILDING OR CAGE
                - 1. BEDDING REQUIREMENTS
                - 2. VENTILATION REQUIREMENTS
                - 3. SANITATION PROCEDURES
            - (C) FARROWING PENS
                - 1. MAKING READY
                - 2. USE OF HEAT LAMP
                - 3. ANIMAL ADJUSTMENT (GILTS)
                - 4. SANITATION PROCEDURES
            - (D) LAMBING PEN
                - 1. MAKING READY
                - 2. USE OF HEAT LAMP
                - 3. ANIMAL ADJUSTMENT (YOUNG EYES)
                - 4. SANITATION PROCEDURES
        - (2) PASTURE OR DRY LOT ALONG WITH SHELTER

- (A) ANIMALS ADAPTABLE TO THIS TYPE OF MANAGEMENT
- (B) TYPE OF SHELTER NEEDED
- (C) ADVANTAGES OF THIS TYPE OF MANAGEMENT
- (D) DISADVANTAGES OF THIS TYPE OF MANAGEMENT

B. WARM WEATHER CONDITIONS

(1) USE OF PASTURE FOR PARTURITION

- (A) PROPER FENCING
- (B) ADVANTAGES
- (C) DISADVANTAGES

(2) USE OF BUILDING FOR PARTURITION

- (A) BEDDING REQUIREMENTS
- (B) VENTILATION REQUIREMENTS
- (C) FARROWING PENS

  1. MAKING READY
  2. ANIMAL ADJUSTMENT
  3. SANITATION PROCEDURES

- (D) LAMBING PENS

  1. MAKING READY
  2. ANIMAL ADJUSTMENT
  3. SANITATION PROCEDURES

- (E) ADVANTAGES
- (F) DISADVANTAGES

C. RATION FORMULATION AND FEEDING FEMALES NEAR PARTURITION

- (1) BULKINESS
- (2) LAXATIVE
- (3) AMOUNT TO FEED
- (4) AVAILABILITY OF WATER

D. PUTTING SPRINGING DAIRY HEIFER WITH MILKING HERD ONE TO TWO WEEKS PRIOR TO CALVING FOR ENVIRONMENTAL ADJUSTMENT

- (1) COMFORT STALL, STANCHION OR MILKING PARLOR
- (2) FEEDING PROCEDURES
- (3) MILKING PROCEDURES
- (4) OTHER ROUTINES ASSOCIATED WITH DAIRY HERD MANAGEMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS CONSULT WITH A LIVESTOCK PRODUCER ABOUT THE DIFFERENCES BETWEEN THE GESTATION AND REGULAR RATION FED TO THEIR LIVESTOCK. HAVE THE STUDENTS ANALYZE THE RATIONS TO SEE IF THEY ARE BALANCED FOR THE ANIMALS RECEIVING THEM.

2. TAKE A FIELD TRIP TO A FARM AND HAVE THE STUDENTS IDENTIFY THE NATURAL SHELTERS THAT COULD BE USED FOR PROTECTION FROM THE WEATHER BY THE TYPES OF LIVESTOCK RAISED ON THAT FARM.

3. HAVE EACH STUDENT FORMULATE A BASIC GESTATION RATION FOR BEEF COWS. EACH STUDENT SHOULD THEN TELL HOW HE WOULD CHANGE THIS RATION WITHIN TWO TO FOUR WEEKS BEFORE PARTURITION TIME.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT FORMULATE A RATION FOR A GESTATING FEMALE OF THE SPECIES WITH WHICH HE WORKS. IF POSSIBLE, HAVE HIM FEED THIS RATION TO HIS LIVESTOCK AND HAVE THE STUDENT MAKE ADJUSTMENTS IN RATIONS IF THE LIVESTOCK DO NOT PERFORM WELL. A REPORT ON THIS CAN BE EVALUATED BY THE TEACHER.

2. HAVE THE STUDENT LIST IN WRITING (PAPER AND PENCIL EXAMINATIONS) THREE TYPES OF SHELTER THAT MIGHT BE USED FOR GESTATING SHEEP. HAVE THE STUDENT SELECT THE TYPE WHICH HE WOULD MOST LIKELY USE IF HE WERE TO RAISE THIS TYPE OF ANIMAL AND GIVE REASONS WHY HE WOULD CHOOSE THIS SHELTER.

3. HAVE THE STUDENT EXPLAIN IN WRITING THE PROCEDURE TO USE IN INTRODUCING SOWS TO FARROWING CRATES PRIOR TO PARTURITION TIME.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES AND PICTURES OF DIFFERENT TYPES OF SHELTERS FOR ANIMALS

2. OVERHEAD PROJECTOR AND TRANSPARENCIES TO AID IN CLASS DISCUSSIONS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CARING FOR THE SWINE HERD DURING BREEDING AND GESTATION. VAS 1034. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1962, 4 PAGES.

   THIS REFERENCE DISCUSSES HOW TO FEED, HOUSE AND PROVIDE EXERCISE FOR THE GESTATING SOWS.

2. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

   THIS REFERENCE PROVIDES INFORMATION ON MANAGEMENT OF THE GESTATING FEMALE OF EACH SPECIES OF FARM LIVESTOCK. THE DISCUSSION IS NOT LENGTHY BUT IS GENERAL IN NATURE.

3. ENSMINGER, M. E. HORSES AND HORSEMANSHIP. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, 915 PAGES.

   A COMPREHENSIVE TEXT, THIS REFERENCE IS WRITTEN AT THE STUDENT LEVEL AND DEALS WITH ALL TYPES OF HORSE MANAGEMENT INCLUDING HOW TO CARE AND MANAGE THE GESTATING MARE.

CARE AND MANAGEMENT OF FEMALE AND OFFSPRING AT PARTURITION

UNIT CONCEPT: DELIVERY AND THE PERIOD IMMEDIATELY FOLLOWING BIRTH ARE CRITICAL TIMES FOR BOTH THE MOTHER AND NEWLY BORN. THE LIVESTOCK BREEDER MUST KNOW WHAT MANAGEMENT PRACTICES SHOULD BE PERFORMED AT THIS TIME TO SAFEGUARD BOTH MOTHER AND OFFSPRING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A FEMALE OF A CERTAIN SPECIES IN THE LATTER STAGES OF GESTATION, DETERMINE THOSE ANIMALS WHICH ARE NEAR PARTURITION ACCORDING TO SYMPTOMS TYPICAL OF SPECIES.

2. WHEN GIVEN A FEMALE OF A CERTAIN SPECIES APPROACHING PARTURITION, PREPARE FEMALE AND FACILITIES FOR PARTURITION TO INSURE BOTH MOTHER AND OFFSPRING A SAFE DELIVERY.

3. WHEN GIVEN FEMALE HAVING TROUBLE IN THE DELIVERY PROCESS, IDENTIFY THE PROBLEM AND GIVE NECESSARY ASSISTANCE IF THE PROBLEM IS NOT TOO COMPLICATED OR SECURE SKILLED HELP IF IT IS NEEDED TO INSURE THAT THE DELIVERY IS AS NORMAL AS POSSIBLE.

4. WHEN GIVEN A NEWBORN ANIMAL, PERFORM MANAGEMENT TASKS NECESSARY TO INCREASE ANIMAL'S CHANCES FOR SURVIVAL.

5. WHEN GIVEN A FEMALE THAT HAS NOT CLEANED (SHED THE AFTERBIRTH) WITHIN A REASONABLE TIME AFTER PARTURITION, ASSIST THE ANIMAL OR GET PROPER HELP TO DO SO BEFORE THE ANIMAL'S HEALTH IS AFFECTED.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE SIGNS OF APPROACHING PARTURITION

   A. PHYSICAL OR VISUAL CHANGES

      (1) MAMMARY SYSTEM
      (2) REPRODUCTIVE SYSTEM (VULVA)
      (3) MUSCULAR SYSTEM

         (A) SHRINKAGE
         (B) RELAXING

(4) OTHER CHANGES

(A) NERVOUSNESS
(B) RESTLESSNESS
(C) BED- OR NEST-MAKING

2. PREPARATION FOR PARTURITION

A. CONDITIONS WHICH ARE PREFERRED BY THE NATURE OF THE ANIMALS WHEN GIVING BIRTH

B. ENVIRONMENTAL CONDITIONS WHICH ARE CONDUCIVE TO THE HEALTH OF OFFSPRING AT BIRTH

(1) VENTILATION
(2) BEDDING
(3) SANITATION

C. FEEDING PRACTICES WHICH ARE HELPFUL TO THE FEMALE PRIOR TO AND AT BIRTH

(1) TYPE OF FEED
(2) AMOUNT OF FEED
(3) WATER

D. PREPARATION OF FEMALES WHICH WILL IMPROVE SANITATION OR THE PROCESS OF BIRTH

(1) WASHING
(2) CLIPPING WOOL OR HAIR AROUND VULVA AMD TEATS
(3) OTHER PROCEDURES

E. PREPARATIONS WHICH ARE UNIQUE TO DIFFERENT TYPES OF LIVESTOCK

(1) COWS
(2) EWES

(A) LAMBING PENS
(B) HEAT LAMPS

(3) MARES
(4) SOWS

(A) FARROWING CRATES
(B) HEAT LAMPS

(5) DOGS
(6) CATS
(7) OTHER

3. DETERMINING IF SPECIAL CARE IS NEEDED BY THE FEMALE BEFORE, DURING OR AFTER PARTURITION
    A. NORMAL PHYSIOLOGICAL PROCESSES OF BIRTH (NORMAL PRESENTATION)
    B. DELIVERY PROBLEMS
        (1) TYPES OF PROBLEMS OFTEN OCCURRING IN ANIMALS
            (A) PROLAPSE OF UTERUS
            (B) ABNORMAL PRESENTATION
            (C) LARGE OFFSPRING
            (D) MILK FEVER
            (E) RETAINED PLACENTA
            (F) OTHER
        (2) WAYS OF IDENTIFYING THESE PROBLEMS
        (3) METHODS FOR CORRECTING THESE PROBLEMS
        (4) WHEN TO SECURE KNOWLEDGEABLE HELP
4. CARING FOR OFFSPRING IMMEDIATELY FOLLOWING BIRTH
    A. CHECK AIRWAYS FOR OBSTRUCTION
        (1) MOUTH
        (2) NOSE
    B. PREVENTION OF INFECTION PROBLEM (NAVEL)
    C. PROVIDING HELP FOR NURSING OFFSPRING
    D. ARTIFICIAL REARING OF OFFSPRING
    E. SPECIFIC CARE FOR VARIOUS SPECIES
        (1) PIGS
            (A) CLIPPING NEEDLE TEETH
            (B) NOTCHING EARS
            (C) PREVENTING ANEMIA
            (D) OTHER
        (2) CALVES
            (A) IDENTIFICATION PROCEDURES
            (B) OTHER
        (3) LAMBS
            (A) IDENTIFICATION PROCEDURES
            (B) OTHER

(4) FOALS

(A) MECONIUM PLUG REMOVED
(B) ANTIBIOTIC ADMINISTRATION
(C) IDENTFICATION PROCEDURES
(D) OTHER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS OBSERVE FEMALES THAT ARE CLOSE TO PARTURITION AND IDENTIFY THOSE THAT ARE IN THE LAST DAY OR TWO OF GESTATION. THE USE OF LABORATORY ANIMALS IN THE CLASSROOM MIGHT MAKE THIS ACTIVITY MORE AVAILABLE.

2. HAVE STUDENTS PREPARE OR HELP PREPARE QUARTERS FOR GIVING BIRTH IN NORMAL AND ADVERSE WEATHER CONDITIONS FOR VARIOUS CLASSES OF LIVESTOCK.

3. A. VISIT A FARM WHEN A VETERINARIAN HAS BEEN CALLED TO ASSIST WITH AN ABNORMAL BIRTH. HAVE HIM EXPLAIN WHAT HE HAD TO DO. IF SUCH A TRIP IS NOT FEASIBLE, VISIT A VETERINARIAN AND HAVE HIM EXPLAIN WITH THE USE OF PICTURES OR MODELS SOME OF THE PROBLEMS ENCOUNTERED AND HOW HE HAS TO CORRECT EACH.

   B. IF POSSIBLE, HAVE STUDENTS ASSIST IN THE DELIVERY PROCESS - HELPING PULL CALF AND SO ON.

4. HAVE THE STUDENTS WITNESS A SOW WHEN FARROWING. HAVE THE STUDENTS REMOVE EXCESSIVE UMBILICAL CORD AND PAINT WITH IODINE, CLIP NEEDLE TEETH AND NOTCH EARS.

5. HAVE THE STUDENTS EXAMINE AN AFTERBIRTH, ESPECIALLY THE COTYLEDONS. EXPLAIN WHAT HAPPENS TO CAUSE A FEMALE TO RETAIN HER AFTERBIRTH AND EMPHASIZE THE IMPORTANCE OF ITS REMOVAL BEFORE AN EXTENDED PERIOD OF TIME (FORTY-EIGHT HOURS) HAS ELAPSED.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. THE STUDENT WILL EXPLAIN IN WRITING THE SYMPTOMS THAT A SOW WILL EXHIBIT ONE TO TWO WEEKS PRIOR TO FARROWING.

2. HAVE THE STUDENT EXPLAIN IN WRITING THE PREPARATIONS HE WOULD MAKE IN HIS FACILITIES IN ANTICIPATION OF AN EWE'S LAMBING.

3. GIVEN A SITUATION OF AN ABNORMAL BIRTH, HAVE THE STUDENT EXPLAIN IN WRITING OR PERFORM WITH MODELS HOW HE WOULD CORRECT THIS PROBLEM SO THE BIRTH PROCESS COULD GO ON NORMALLY.

4. HAVE THE STUDENT EXPLAIN HOW HE WOULD TREAT BABY PIGS AT FARROWING TIME. EACH TASK SHOULD BE EXPLAINED AS TO WHEN IT SHOULD BE PERFORMED, WHY IT SHOULD BE PERFORMED AND HOW IT SHOULD BE PERFORMED.

5. GIVEN AN EWE THAT HAS NOT CLEANED (SHED AFTERBIRTH) WITHIN TWENTY-FOUR HOURS, HAVE THE STUDENT EXPLAIN WHAT HE WOULD DO TO REMEDY THE MATTER.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PICTURES OR MODELS OF ANIMALS IN THE LATTER STAGES OF GESTATION
2. PICTURES OR MODELS OF ANIMALS WITH OFFSPRING IN ABNORMAL POSITIONS
3. IODINE
4. CLEAN SOD OR IRON SULFATE
5. EAR NOTCHERS FOR SWINE
6. SMALL SURGICAL SCISSORS FOR CLIPPING TEATS
7. NIPPERS FOR CUTTING NEEDLE TEETH (SHARP DIAGONAL PLIERS WORK WELL)
8. HEAT LAMPS
9. BUCKET OF WARM WATER
10. EMASCULATOR
11. MARKING PAINT
12. EAR TAGS
13. REPRODUCTION RECORD BOOKS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ADVANCED LIVESTOCK PRODUCTION - "CARE AND MANAGEMENT OF COW AND CALF." COLUMBIA, MISSOURI: INSTRUCTIONAL MATERIALS LABORATORY, UNIVERSITY OF MISSOURI. PP. 50-51.

   THIS REFERENCE PROVIDES INFORMATION IN OUTLINE FORM ON THE CARE AND MANAGEMENT OF COW AND CALF. IT ALSO PROVIDES ILLUSTRATIONS SUITABLE FOR MAKING TRANSPARENCIES

ON THE NORMAL AND ABNORMAL PRESENTATIONS OF THE CALF.

2. ENSMINGER, M. D. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

   THIS STUDENT REFERENCE PROVIDES INFORMATION RELATIVE TO CARE AND MANAGEMENT OF THE FEMALE AND OFFSPRING AT PARTURITION ON EACH OF THE APPROPRIATE FARM LIVESTOCK.

3. ROEDIGER, ROGER D. LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 194 PAGES.

   THIS STUDENT REFERENCE PROVIDES INFORMATION ON THE GESTATION AND PARTURITION OF THE BOVINE SPECIES INCLUDING ILLUSTRATIONS OF ABNORMAL BIRTH POSITIONS.

REBREEDING LIVESTOCK

UNIT CONCEPT: ONCE A FEMALE HAS GIVEN BIRTH, THE ANIMAL BREEDER MUST PLAN WHEN BEST TO REBREED THIS FEMALE FOR PROFITABLE PRODUCTION. YET HE MUST NOT PUT UNDUE STRESS ON THIS FEMALE'S PRODUCTION EFFICIENCY BY DISREGARDING THE PHYSIOLOGICAL NEEDS OF HER REPRODUCTIVE SYSTEM AND HER BODY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR A GIVEN FEMALE OF A CERTAIN ANIMAL SPECIES THAT HAS JUST GIVEN BIRTH, DETERMINE WHEN THAT FEMALE WILL SHOW THE FIRST SIGNS OF ESTRUS UNDER NORMAL CIRCUMSTANCES.

2. WHEN GIVEN AN UNBRED FEMALE OF A CERTAIN ANIMAL SPECIES JUST AFTER PARTURITION, DETERMINE THE BEST TIME FOR REBREEDING THAT FEMALE IN ORDER TO HAVE THE BEST CHANCE FOR CONCEPTION TO TAKE PLACE.

3. WHEN GIVEN AN UNBRED FEMALE OF A CERTAIN ANIMAL SPECIES THAT IS A PROBLEM BREEDER, DETERMINE PROCEDURES TO FOLLOW IN ORDER TO INCREASE THE CHANCES OF THAT FEMALE BECOMING PREGNANT.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE PRODUCTION GOALS OF ANIMAL BREEDERS IN TERMS OF OFFSPRING AND MILK PRODUCTION

   A. DAIRY CATTLE CALVING INTERVAL

      (1) LENGTH OF GESTATION
      (2) LENGTH OF LACTATION
      (3) MOST DESIRABLE CALVING INTERVAL FOR REPRODUCTIVE AND PRODUCTION EFFICIENCY

   B. BEEF CATTLE CALVING INTERVAL

      (1) LENGTH OF GESTATION
      (2) LENGTH OF TIME BEFORE WEANING PREVIOUS CALF
      (3) MOST DESIRABLE CALVING INTERVAL

   C. SWINE LITTER INTERVAL

      (1) LENGTH OF GESTATION

   (2) LENGTH OF TIME BEFORE WEANING PREVIOUS LITTER
   (3) MOST DESIRABLE LITTER INTERVAL

2. IDENTIFYING THE FIRST ESTRUS AFTER PARTURITION

   A. SPECIES DIFFERENCES IN ONSET OF FIRST HEAT

   B. REASONS FOR NOT BREEDING ANIMAL AT THIS ESTRUS

   C. REASONS FOR BREEDING ANIMAL AT FIRST ESTRUS

   D. PRACTICAL VALUE OF RECOGNIZING THIS ESTRUS

3. DETERMINING THE BEST TIME TO REBREED ANIMAL AFTER PARTURITION

   A. CONDITION OF REPRODUCTIVE TRACT

   B. PRODUCTION GOALS

   C. RELATIONSHIP OF CONDITION OF REPRODUCTIVE TRACT AND PRODUCTION GOALS

   D. BEST TIME TO REBREED DIFFERENT SPECIES

      (1) DAIRY CATTLE
      (2) BEEF CATTLE
      (3) SHEEP
      (4) SWINE
      (5) HORSES
      (6) DOGS
      (7) OTHER

4. METHODS TO AID IN BRINGING ANIMAL INTO HEAT (ESTRUS)

   A. WEANING OFFSPRING (SWINE)

   B. TEASING (HORSES)

   C. GOMER BULL OR VASECTIMIZED RAM

   D. OTHER METHODS

5. IDENTIFYING THE PROCEDURES TO FOLLOW IN INCREASE THE CHANCES OF GETTING THE PROBLEM BREEDERS PREGNANT

   A. CHECK BY VETERINARIAN

B. PROPER INSEMINATION TIME (ARTIFICIAL INSEMINATION AND NATURAL)

C. ACCURATE RECORDS

D. PREGNANCY CHECK

E. PROCEDURES FOR OVERWEIGHT FEMALE

F. DETERMINING HOW FAR TO GO BEFORE CULLING PROBLEM BREEDER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENT PREPARE A CHART FOR HIS NOTEBOOK LISTING WHEN THE COMMON FARM LIVESTOCK WILL FIRST COME INTO HEAT AFTER PARTURITION.

2. HAVE THE STUDENT DETERMINE THE PROPER TIME TO REBREED A DAIRY COW AFTER SHE HAS CALVED.

3. HAVE A VETERINARIAN DISCUSS WITH THE CLASS SOME OF THE TECHNIQUES THAT MAY BE USED TO AID IN GETTING A PROBLEM BREEDER SUCCESSFULLY BRED.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. THE STUDENT SHALL EXPLAIN IN WRITING WHEN A SOW IS LIKELY TO COME INTO HEAT AFTER FARROWING AND FURTHER EXPLAIN WHY HE WOULD OR WOULD NOT BREED HER AT THIS TIME.

2. HAVE THE STUDENT EXPLAIN HIS REASONS FOR DETERMINING THE MOST DESIRABLE TIME TO REBREED A BEEF COW AFTER SHE HAS CALVED.

3. HAVE THE STUDENT EXPLAIN THE PROCEDURES HE WOULD USE IN ATTEMPTING TO GET HIS BEST DAIRY COW BRED IF SHE WERE A PROBLEM BREEDER. HOW LONG WOULD HE WAIT BEFORE HE CULLED HER FROM THE HERD?

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OVERHEAD PROJECTOR AND TRANSPARENCIES RELATED TO TOPIC OF REBREEDING ANIMALS

2. SOURCE OF ACTUAL ANIMALS FOR OBSERVATION AND REBREEDING

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, PP. 1-50.

   THIS STUDENT REFERENCE PROVIDES A CHAPTER ON BREEDING LIVESTOCK WHERE [illegible] STUDENT MAY FIND SUCH INFORMATION AS LENGTH OF GESTATION AND LACTATION FOR VARIOUS FARM LIVESTOCK.

2. ROEDIGER, ROGER [illegible] LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, PP. 87-93.

   THIS STUDENT REFERENCE GOES INTO DETAIL ABOUT REBREEDING FARM LIVESTOCK. ILLUSTRATIONS AND GRAPHS ARE ALSO INCLUDED IN THIS CHAPTER.

BREEDING SYSTEMS

UNIT CONCEPT: THERE ARE MANY DIFFERENT SYSTEMS OF BREEDING THAT MAY BE EMPLOYED BY THE ANIMAL BREEDER, BUT NO BEST ONE FOR ALL LIVESTOCK BREEDERS. KNOWING ABOUT EACH OF THESE SYSTEMS, THEIR ADVANTAGES AND DISADVANTAGES, HELPS THE BREEDER TO SELECT THE SYSTEM(S) THAT WILL RENDER THE TYPE OF OFFSPRING HE DESIRES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A CERTAIN SPECIES OF ANIMALS, THEIR PRODUCTIVE PURPOSE AND A LIST OF THE VARIOUS SYSTEMS OF BREEDING, DETERMINE THE BREEDING METHOD(S) HE MAY USE ON THESE ANIMALS IN ORDER TO OBTAIN THE MOST DESIRABLE TYPE OF OFFSPRING.

B. INSTRUCITONAL AREAS

1. DETERMINING THE FACTORS INVOLVED IN SELECTING A SYSTEM OF BREEDING
   - A. GOALS OF PRODUCTION
   - B. OWNER'S RESOURCES

*2. IDENTIFYING THE SYSTEM OF INBREEDING
   - A. DEFINITION OF INBREEDING
   - B. RELATIVE DEGREE OF RELATIONSHIP OF ANIMALS MATED
   - C. PURPOSES OF SYSTEM
   - D. ADVANTAGES OF SYSTEM
   - E. DISADVANTAGES OF SYSTEM
   - F. SYSTEM'S MOST COMMON USE

* Place each of the following systems of breeding in B.2 and put in the appropriate information:

1. Close breeding
2. Linebreeding

3. Purebreeding
4. Upgrading or grading up
5. Outbreeding or crossing
6. Crossbreeding

    a. Single cross
    b. Double cross
    c. Triple cross

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE THE STUDENTS STUDY FARM RECORDS OR INTERVIEW FARMERS TO COMPARE PRODUCTION OF CROSSBRED ANIMALS WITH PUREBRED AND LINEBRED ANIMALS.

    B. HAVE STUDENTS COMPARE THE OVERHEAD COSTS BETWEEN PRODUCING PUREBRED AND CROSSBRED ANIMALS.

    C. HAVE THE STUDENTS FIND WHAT COMMERCIAL BREEDING SYSTEMS ARE USED IN THEIR AREA. WHAT BREEDS ARE USED IN THE CROSSES AND HOW ARE THE REPLACEMENT BREEDING STOCK SELECTED?

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENT CHOOSE THE THREE BREEDS OF SWINE HE WOULD USE IN A TRIPLE CROSS PROGRAM. HAVE EACH STUDENT EXPLAIN WHAT BREED AND SEX HE WOULD MATE FOR THE F_1 CROSS, WHAT HE WOULD SELECT FROM F_1 (SEX) TO BREED WITH WHAT SEX AND BREED FOR THE F_2 AND SO ON. FINALLY, HE SHOULD TELL WHY HE DEVELOPED THIS TRIPLE CROSS AS HE DID. EMPHASIS SHOULD BE PLACED ON COMBINING THE MOST DESIRABLE CHARACTERISTICS OF EACH BREED INTO A SUPERIOR F_3 OFFSPRING.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. ILLUSTRATED DIAGRAMS AND POSTERS OF THE DIFFERENT SYSTEMS OF BREEDING

2. OVERHEAD PROJECTOR AND TRANSPARENCIES RELATED TO TOPIC

F. EXAMPLES OF SUPPORTING REFERENCES

1. ACKER, DUANE. ANIMAL SCIENCE AND INDUSTRY. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1971, PP. 276-288.

THIS REFERENCE PROVIDES A CHAPTER DEALING WITH THE TOPIC OF BREEDING PROGRAMS.

2. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 55-64.

   THIS TEXT, WRITTEN AT THE HIGH SCHOOL LEVEL, PROVIDES IN-DEPTH DISCUSSION ON THE TOPIC OF SYSTEMS OF BREEDING, USING EXAMPLES AND ILLUSTRATIONS.

3. ROEDIGER, ROGER D. LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, PP. 133-148.

   THIS STUDENT REFERENCE PROVIDES DISCUSSION, ILLUSTRATIONS AND STUDENT ACTIVITIES PERTAINING TO THE TOPIC OF SYSTEMS OF BREEDING FARM LIVESTOCK.

4. SYSTEMS OF SWINE BREEDING. VAS 1039. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1965, 8 PAGES.

   THIS REFERENCE PROVIDES SPECIFIC INFORMATION ABOUT METHODS OF BREEDING SWINE AND IS WRITTEN AT THE STUDENT LEVEL.

MANAGEMENT AND FUNCTION OF THE MALE BREEDING ANIMAL

UNIT CONCEPT: THE BREEDING MALE PLAYS A VERY IMPORTANT ROLE IN THE TOTAL BREEDING PROGRAM. THE ANIMAL BREEDER MUST PROVIDE THE PROPER CARE FOR THIS INDIVIDUAL IF HE HOPES TO MAINTAIN A HIGH CONCEPTION RATE AND A LONG PRODUCTIVE LIFE FOR THE BREEDING MALE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A DIAGRAM OF THE MALE'S REPRODUCTIVE TRACT FOR A CERTAIN SPECIES OF LIVESTOCK, NAME EACH PART AND DESCRIBE ITS FUNCTION AS DEFINED BY A STANDARD REFERENCE ON THE SUBJECT.

2. WHEN GIVEN A BREEDING MALE OF A CERTAIN ANIMAL SPECIES:

   A. DETERMINE THE RATION AND METHODS FOR FEEDING THAT ANIMAL TO MAINTAIN HIM IN A GOOD, HEALTHY BREEDING CONDITION THROUGHOUT THE YEAR.

   B. DETERMINE THE HOUSING THAT IS NEEDED IN ORDER TO KEEP HIM IN A GOOD HEALTHY BREEDING CONDITION THROUGHOUT THE YEAR.

   C. DETERMINE ANY SPECIAL MANAGEMENT PROCEDURES THAT MIGHT BE NEEDED DURING THE BREEDING PERIOD TO INSURE A HIGH CONCEPTION RATE, SANITATION OR SAFETY TO THE MALE AND FEMALE.

3. WHEN GIVEN THE BREEDING FEMALE OF A CERTAIN ANIMAL SPECIES, DETERMINE WHEN IT IS TO THE STUDENT'S ADVANTAGE TO USE THE BREEDING MALE FOR NATURAL INSEMINATION OF HIS FEMALES OR TO USE ARTIFICIAL INSEMINATION TO INSURE THE GREATEST PRODUCTIVE EFFICIENCY.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE FUNCTION OF THE BREEDING MALE ANIMAL IN THE REPRODUCTIVE PROCESS

   A. SPERMATOGENESIS IN THE REPRODUCTIVE TRACT

      (1) PARTS OF THE REPRODUCTIVE TRACT AND THEIR FUNCTIONS

(A) TESTICLE
(B) EPDIDYMIS
(C) VAS DEFERENS
(D) SPERMATIC CORD
(E) URETHRA
(F) PENIS
(G) PENIS RETRACTOR MUSCLE
(H) SIGMOID FLEXOR
(I) SHEATH
(J) GLANS PENIS
(K) PREPUCE

(2) ACCESSORY GLANDS AND THEIR FUNCTION

(A) SEMINAL VESCICLES
(B) PROSTATE
(C) COWPERS

(3) HORMONES OF REPRODUCTION
(4) PRODUCTION OF SPERM IN THE TESTICLE
(5) SPERM COUNT PER EJACULATION

B. COPULATION WITH FEMALE

(1) COPULATION ORGAN
(2) CAUSE OF EJACULATION AND SPERM MIGRATION IN FEMALE REPRODUCTIVE TRACT
(3) AGE WHEN MALE REACHES PUBERTY
(4) AGE WHEN TO FIRST USE THE MALE FOR BREEDING
(5) NUMBER OF FEMALES TO BREED PER MALE

(A) PER DAY

1. YOUNG MALE
2. MATURE MALE

(B) PER BREEDING SEASON

1. YOUNG MALE
2. MATURE MALE

(6) REPEAT BREEDING TECHNIQUES DURING SAME ESTRUS PERIOD

(A) PURPOSE
(B) IMPORTANCE OF CONTROLLING MALE IN NUMBER OF REPEAT BREEDINGS
(C) WHEN BEST TO PERFORM REPEAT BREEDING DURING ESTRUS PERIOD

(7) RELATIONSHIP OF LIBIDO (SEX DRIVE) AND AMOUNT OF BREEDING USE GIVEN TO MALE

(8) MALE-FEMALE COMPATABILITY

2. IDENTIFYING THE FEEDING PRACTICES TO USE ON THE BREEDING MALE

    A. TYPES OF FEEDS TO USE

        (1) ROUGHAGES
        (2) GRAINS
        (3) LIQUID SUPPLEMENT

    B. AMOUNTS TO FEED

        (1) ROUGHAGES
        (2) GRAINS

    C. SELF-FEEDING THE MALE

        (1) CHARACTERISTICS OF SELF-FED FEED
        (2) USE OF PELLETED RATION

    D. USE OF PASTURE TO FEED MALE

        (1) SPRING AND SUMMER
        (2) FALL AND WINTER
        (3) SUPPLEMENTATION

            (A) LIQUID PROTEIN
            (B) DRY PROTEIN

    E. BAROMETER FOR DETERMINING THE DEGREE OF SUCCESS OF THE FEEDING PROGRAM

        (1) FINISH ON MALE
        (2) HEALTH OF MALE
        (3) REPRODUCTION EFFICIENCY

3. DETERMINING THE PROPER TYPE OF HOUSING FOR THE BREEDING MALE

    A. TYPE OF ANIMAL

        (1) OUTDOOR ANIMAL

            (A) INFLUENCE OF SEASON OF YEAR ON HOUSING
            (B) INFLUENCE OF AMOUNT OF EXERCISE NEEDED ON HOUSING

        (2) INDOOR ANIMAL

            (A) CAGE-TYPE ANIMAL
            (B) PET-TYPE ANIMAL

B. BREEDING SEASON HOUSING

  (1) CAGE ANIMALS
  (2) FARM ANIMALS

    (A) SAME AS FEMALE QUARTERS - PASTURE BREEDING
    (B) SEPARATE QUARTERS - HAND BREEDING

C. HOUSING FOR NON-BREEDING SEASON

D. PROVIDING ROOM FOR EXERCISE OF MALE

  (1) CAGE MANAGEMENT
  (2) PEN MANAGEMENT
  (3) PADDOCK
  (4) PASTURE
  (5) CONTROLLING EXERCISE

    (A) FEED AND WATER PLACEMENT
    (B) FORCED

4. IDENTIFYING MISCELLANEOUS MANAGEMENT PROCEDURES OF BREEDING MALES

A. PREVENTING OVER-EXCITEMENT

  (1) LOCATING QUARTERS TO ISOLATE MALES
  (2) HANDLING PROPERLY
  (3) RANTING OF BOARS

B. TRIMMING HOOVES

  (1) PROPER TIME
  (2) METHODS OF SHAPING AND FORMING
  (3) EQUIPMENT

C. CLIPPING BOARS' TUSKS

  (1) PROPER TIME
  (2) METHODS
  (3) EQUIPMENT

D. GROOMING

  (1) EASE OF HANDLING
  (2) HEALTH ASPECTS

E. BREEDING SCRUB FEMALES FIRST

  (1) PURPOSE
  (2) ADVANTAGES

F. WASHING REPRODUCTIVE ORGANS OF STALLIONS

 (1) PURPOSE
 (2) SOLUTION USED

G. MARKING THE MALE (RAM)

 (1) PURPOSE
 (2) METHODS USED

H. VASECTIMIZING THE MALE

 (1) PURPOSE
 (2) METHODS USED

I. PURPOSE OF LETTING RAM IN WITH FEMALES ONLY AT NIGHT

 (1) SEASON OF YEAR
 (2) CONCEPTION RATE

J. SHEARING RAMS

 (1) PURPOSE
 (2) METHODS USED

K. OTHER MISCELLANEOUS MANAGEMENT PRACTICES

5. DETERMINING THE PROCEDURES USED IN NATURAL BREEDING OF ANIMALS

A. PASTURE BREEDING

 (1) DEFINITION
 (2) NUMBER OF FEMALES PER MALE
 (3) HEAT DETECTION
 (4) BREEDING RECORDS
 (5) CONCEPTION RATE
 (6) EQUIPMENT AND FACILITIES NEEDED
 (7) ADVANTAGES
 (8) DISADVANTAGES

B. HAND BREEDING

C. CAGE BREEDING

D. OTHER PROCEDURES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. PROVIDE THE STUDENT WITH A TESTICLE OF LARGE SIZE (FROM LARGE RAM OR BULL). HAVE HIM DISSECT THIS AND LIST THE COMPONENT PARTS AS HE OBSERVES THEM ON A DIAGRAM IN HIS NOTEBOOK.

2. A. HAVE THE STUDENT BALANCE A LEAST COST MAINTENANCE RATION THAT WILL MEET THE NUTRITIVE NEEDS OF A MATURE BREEDING BULL DURING THE SPRING AND WINTER OF THE YEAR.

   B. HAVE THE STUDENT DESIGN AN AUTOMATIC EXERCIZER FOR A STALLION.

   C. TAKE A FIELD TRIP TO A FARM AND HAVE THE STUDENTS TRIM THE FEET OF A RAM. SHEAR THE ANIMAL TO COOL AND MAKE THE MATING PROCESS EASIER.

3. HAVE THE STUDENT TALK TO LOCAL FARMERS AND SURVEY THEM AS TO THEIR ATTITUDES ON ARTIFICIAL AND NATURAL BREEDING TECHNIQUES. FIND OUT WHICH METHOD THEY USE MOST ON THEIR FARMS AND WHY THEY USE IT MOST.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE THE STUDENT A PARTIALLY FILLED-IN DIAGRAM OF A MALE REPRODUCTIVE TRACT. ASK EACH STUDENT TO NAME THE COMPONENT PARTS ASKED FOR ON THE DIAGRAM AND STATE THE FUNCTION OF NOT ONLY EACH PART ASKED FOR, BUT ALSO THE FUNCTION OF THE MALE ANIMAL IN REPRODUCTION.

2. A. HAVE THE STUDENT DESCRIBE IN WRITING THE WAY HE WOULD FEED THE BREEDING BOAR. INCLUDED SHOULD BE THE CHARACTERISTICS OF THE RATION AND THE METHOD HE PLANS TO USE IN FEEDING THIS BOAR.

   B. HAVE THE STUDENT SELECT A BREEDING MALE OF HIS CHOICE AS TO SPECIES. EACH STUDENT WILL THEN DESIGN A FACILITY TO INSURE THE PROPER HOUSING AND EXERCISE FOR THAT MALE. STUDENTS SHOULD INCLUDE ANY SPECIFIC INFORMATION AS TO HOW EXERCISING WILL BE ACCOMPLISHED IN HIS FACILITY.

   C. ASK THE STUDENT TO PUT A MARKING HARNESS ON A RAM PRIOR TO TURNING THE RAM IN WITH THE EWES. HAVE THE STUDENT EXPLAIN THE PROCEDURE HE WILL FOLLOW IN REGARD TO THE COLOR OF MARK USED DURING THE BREEDING SEASON.

3. ASK THE STUDENT TO LIST IN WRITING THE REASONS HE FEELS ARE IMPORTANT AS TO WHY NATURAL BREEDING SHOULD NOT BE COMPLETELY REPLACED BY ARTIFICIAL INSEMINATION IN ANIMALS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SOURCE OF MALE REPRODUCTIVE TRACT, ESPECIALLY TESTICLES
2. FORMALDEHYDE IN WHICH TO KEEP REPRODUCTIVE TRACTS WHILE NOT IN USE
3. SHEEP SHEARS
4. TOE TRIMMERS
5. WOOD CHISEL
6. HAMMERS
7. MALLETS, WOODEN
8. MARKING PAINT
9. MARKING HARNESS FOR RAM
10. BOLT CUTTERS
11. GROOMING BRUSHES AND COMBS
12. MILD DISINFECTANT
13. BUCKETS
14. SOAP
15. DISSECTION KITS
16. DISSECTION TABLE OR SHALLOW PANS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

   THIS COMPREHENSIVE STUDENT REFERENCE PROVIDES A CHAPTER ON BREEDING OF EACH OF THE COMMON FARM ANIMALS. IN THIS DISCUSSION, THE AUTHOR DEVOTES TIME TO THE MANAGEMENT OF THE BREEDING MALE.

2. ENSMINGER, M. E. HORSES AND HORSEMANSHIP. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, 915 PAGES.

THIS COMPREHENSIVE STUDENT REFERENCE IS WRITTEN AT THE STUDENT LEVEL AND DEALS WITH ALL TYPES OF HORSE MANAGEMENT INCLUDING HOW TO CARE FOR AND MANAGE THE BREEDING STALLION.

3. ROEDIGER, ROGER D. LIVESTOCK BREEDING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, PP. 33-46.

   THIS REFERENCE PROVIDES A CHAPTER ON THE MALE'S PART IN REPRODUCTION WITH ILLUSTRATIONS, CHARTS AND STUDENT ACTIVITIES RELATED TO THE DISCUSSION.

LIVESTOCK NUTRITIVE REQUIREMENTS

UNIT CONCEPT: EACH ANIMAL HAS SPECIFIC NUTRIENT NEEDS ACCORDING TO FACTORS SUCH AS HEREDITY, PRODUCTIVE USE, AGE, AND AMOUNT OF ACTIVITY. IN ORDER TO INSURE HEALTHY, PRODUCTIVE ANIMALS AND OBTAIN HIGHEST PROFITS, THE PRODUCER NEEDS TO BE ABLE TO DETERMINE A GIVEN ANIMAL'S NUTRIENT NEEDS AND SELECT THE COMBINATION OF FEEDS WHICH WILL PROVIDE A LEAST-COST BALANCED RATION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. GIVEN A SPECIFIC TYPE OF LIVESTOCK OF KNOWN WEIGHT, SEX AND PRODUCTIVE PURPOSE, LIST THE NUTRIENT REQUIREMENTS OF THAT LIVESTOCK ACCORDING TO RECOMMENDATIONS OF THE NATIONAL RESEARCH COUNCIL OR SIMILAR PUBLICATION.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE EFFECTS OF AN ANIMAL'S CHARACTERISTICS ON NUTRITIVE REQUIREMENTS
    - A. SIZE
    - B. AGE
    - C. SEX
    - D. LACTATION
    - E. GESTATION
    - F. MAINTENANCE
    - G. GROWTH
2. DETERMINING THE EFFECT OF THE ENVIRONMENT ON NUTRITIVE REQUIREMENTS OF ANIMALS
    - A. CLIMATE
    - B. SYSTEM OF MANAGEMENT
    - C. QUALITY OF FEEDS

3. READING A NUTRIENT REQUIREMENT TABLE

A. IDENTIFYING THE NUTRIENTS THAT REQUIRE THE MOST ATTENTION

(1) PROTEIN
(2) CARBOHYDRATES
(3) CALCIUM
(4) PHOSPHORUS
(5) IRON FOR SWINE
(6) CAROTENE
(7) OTHER NUTRIENTS

B. DEFINING THE TERMS AND ABBREVIATIONS USED IN NUTRITIONAL TABLES

(1) G. - GRAM
(2) % - PERCENT
(3) I.U. - INTERNATIONAL UNIT
(4) KG. - KILOGRAM

C. COMPARING THE TOTAL DIGESTIBLE NUTRIENT AND NET ENERGY REQUIREMENT TABLES

4. DETERMINING THE NUTRIENT REQUIREMENTS OF DAIRY CATTLE

A. DEFINING THE CLASSES OR GROUPS OF DAIRY CATTLE WITH SIMILAR NUTRITIONAL NEEDS

(1) GROWING DAIRY STOCK

(A) CALVES
(B) YEARLINGS
(C) FIRST CALF HEIFER

B. DETERMINING THE AMOUNT NEEDED OF EACH NUTRIENT GROUP

(1) PROTEIN
(2) CHO (ENERGY) OR CARBOHYDRATES

(A) TDN - TOTAL DIGESTIBLE NUTRIENTS
(B) NET ENERGY

(3) MINERALS
(4) VITAMINS
(5) WATER

5. DETERMINING THE NUTRIENT REQUIREMENTS OF EACH OF THE OTHER TYPES OF LIVESTOCK INCLUDING BEEF, SHEEP, SWINE, HORSES, POULTRY, LABORATORY AND SPECIALTY ANIMALS.

After selecting the type of livestock whose nutrient requirements you need, place in 4.a. above and go through process similar to example given.

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. GIVE EACH STUDENT THE ASSIGNMENT OF GROUPING THE ANIMALS AT HOME INTO CATEGORIES ACCORDING TO CRITERIA, SUCH AS, SEX, WEIGHT, AGE OR A COMBINATION OF THESE. THE STUDENT MAY FIND THIS IS ALREADY BEING DONE AT HOME. ASK HIM IF HE CAN TELL YOU WHY THIS IS DONE.

B. GIVE THE STUDENTS AN ASSIGNMENT TO DETERMINE THE NUTRITIVE REQUIREMENTS OF A PARTICULAR GROUP OF LIVESTOCK FOUND ON THEIR HOME FARM OR THE FARM ON WHICH THEY WORK.

C. HAVE STUDENTS STUDY THE VARIOUS TABLES OF LIVESTOCK NUTRITION REQUIREMENTS. THEY SHOULD KNOW HOW TO GET THE NUTRITIVE REQUIREMENTS FOR ANY CLASS OF LIVESTOCK USING BOTH THE TOTAL DIGESTIBLE NUTRIENT AND NET ENERGY TABLES.

D. HAVE A CLASS DISCUSSION INVOLVING THE TERMS AND ABBREVIATIONS THAT ARE FOUND IN LIVESTOCK NUTRITION REQUIREMENT TABLES TO MAKE SURE ALL STUDENTS UNDERSTAND THEIR MEANING. SUCH TERMS AS KILOGRAM (KG), DAILY GAIN, DRY FEED, MEGACALORIES (MCAL), GRAM (G), SMALL BREEDS, LARGE BREEDS AND THE TERMS BROUGHT UP BY THE CLASS SHOULD BE DISCUSSED AND DEFINED.

E. DISCUSS WITH THE STUDENTS THE PROS AND CONS OF THE NET ENERGY VERSUS THE TDN SYSTEMS OF LIVESTOCK NUTRITION REQUIREMENTS. DETERMINE WHICH SYSTEM YOU WILL USE IN DETERMINING NUTRIENT REQUIREMENTS.

F. ASSIGN TO EACH STUDENT A PARTICULAR ANIMAL AND HAVE HIM DEFINE THAT ANIMAL'S NUTRITIONAL REQUIREMENTS EVERY TWO WEEKS IN THE CASE OF LACTATING COW OR EVERY MONTH FOR OTHER LIVESTOCK. THIS COULD BE DONE IN CONJUNCTION WITH AN ACTIVITY THAT WILL BE DONE IN THE UNIT ON BALANCING RATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. EVALUATION OF STUDENT ASSIGNMENT OF GROUPING ANIMALS AND DETERMINING THEIR NUTRIENT REQUIREMENTS FOUND ON THE HOME FARM.

B. PAPER AND PENCIL TEST - GIVE THE STUDENTS A PARTICULAR GROUP OF LIVESTOCK AND HAVE THEM LIST THE NUTRIENT REQUIREMENTS FOR EITHER ONE OR BOTH TDN AND NET ENERGY SYSTEMS. PROVIDE THE NECESSARY NUTRITIVE REQUIREMENT TABLE TO THE STUDENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. REFERENCES WITH THE DIFFERENT LIVESTOCK AND DAIRY CATTLE NUTRIENT REQUIREMENT TABLES
    - A. TDN REQUIREMENTS
    - B. NET ENERGY REQUIREMENTS
2. OVERHEAD PROJECTOR WITH TRANSPARENCIES OF NUTRIENT REQUIREMENT TABLES AND OTHER TRANSPARENCIES TO AID IN OTHER STUDENT DISCUSSIONS ON THE TOPIC
3. PROVIDE AT LEAST ONE EXAMPLE PAGE OF A NUTRIENT REQUIREMENT TABLE TO EACH STUDENT
4. LIVESTOCK SCALES, IF POSSIBLE AND PRACTICAL, OTHERWISE SHOULD HAVE WEIGH TAPES FOR EACH DIFFERENT LIVESTOCK IN ORDER TO KEEP TRACK OF WEIGHTS OF ANIMALS TO HELP DETERMINE NUTRITIVE REQUIREMENTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CRAMPTOM, F. W. AND HARRIS, L. E. APPLIED ANIMAL NUTRITION, 2ND EDITION. SAN FRANCISCO, CALIFORNIA: W. H. FREEMAN AND COMPANY.

   THIS REFERENCE PROVIDES VERY UP-TO-DATE INFORMATION INCLUDING ANIMAL NUTRITIVE REQUIREMENT TABLES. THIS SHOULD BE CONSIDERED A TEACHER'S REFERENCE AS IT WOULD BE DIFFICULT FOR AN AVERAGE HIGH SCHOOL STUDENT TO READ.

2. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1960, 667 PAGES.

   THIS BOOK PROVIDES FARM LIVESTOCK NUTRITIVE REQUIREMENT TABLES ALONG WITH SUPPLEMENTARY INFORMATION THAT WILL BE OF VALUE TO THE STUDENT. THE BOOK IS EASILY READ BY HIGH SCHOOL STUDENTS.

3. MORRISON, FRANK B. FEEDS AND FEEDING. 22ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1957, 1165 PAGES.

   THIS REFERENCE PROVIDES FARM LIVESTOCK NUTRITIVE REQUIREMENT TABLES ALONG WITH OTHER NUTRITION AND FEEDING INFORMATION ABOUT THIS TYPE OF ANIMAL.

*4. NUTRIENT REQUIREMENTS OF BEEF CATTLE. FOURTH REVISED EDITION. WASHINGTON, D.C.: PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCE. 1970.

*5. NUTRIENT REQUIREMENTS OF DAIRY CATTLE. FOURTH REVISED EDITION. WASHINGTON, D.C.: PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCE. 1971.

*6. NUTRIENT REQUIREMENTS OF HORSES. SECOND REVISED EDITION. WASHINGTON, D.C.: PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCE. 1966.

*7. NUTRIENT REQUIREMENTS OF LABORATORY ANIMALS. SECOND REVISED EDITION. WASHINGTON, D.C.: PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCE. 1972.

*8. NUTRIENT REQUIREMENTS OF SHEEP. FOURTH REVISED EDITION. WASHINGTON, D.C.: PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCE. 1968.

*9. NUTRIENT REQUIREMENTS OF SWINE. SIXTH REVISED EDITION. WASHINGTON, D.C.: PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCE. 1968.

* THIS SERIES OF ANIMAL REQUIREMENT TABLES IS UP-TO-DATE AND RECOGNIZED BY MOST OF THE AUTHORITIES IN THE NUTRITION FIELD. EACH BOOKLET ALSO PROVIDES VALUABLE SUPPLEMENTARY INFORMATION ABOUT THE NUTRITION OF EACH SPECIES.

THE FOOD NUTRIENT GROUPS AND THEIR FUNCTIONS IN THE ANIMAL BODY

UNIT CONCEPT: AN IMBALANCE OF NUTRIENTS IN A RATION IS USUALLY INEFFICIENT AND OFTEN RESULTS IN HIGH FEED COSTS IN RELATION TO THE NUTRITIONAL BENEFITS TO THE ANIMAL. A DEFICIENCY OF ONE OR MORE OF THE NUTRIENTS MAY IMPAIR NORMAL GROWTH OR PRODUCTION, WHILE AN EXCESS OF ONE OR MORE NUTRIENTS IS OFTEN WASTEFUL AND, IN SOME CASES, TOXIC TO THE ANIMAL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. ORALLY OR IN WRITING, LIST THE SIX BASIC FOOD NUTRIENTS AND EXPLAIN A MINIMUM OF TWO MAJOR FUNCTIONS THAT EACH SERVES IN THE ANIMAL BODY AS DESCRIBED IN A REFERENCE OF STANDARDS SUCH AS THOSE OF THE NATIONAL ACADEMY OF SCIENCES.

2. FROM A LIST OF THE INGREDIENTS FOUND IN A RATION OF EITHER HOME OR COMMERICAL ORIGIN OR A COMBINATION OF THESE TWO, INDICATE ORALLY OR IN WRITING THE PRIMARY NUTRIENT GROUP THAT EACH OF THE INGREDIENTS PROVIDES.

B. INSTRUCTIONAL AREAS

1. MAJOR USES OF FOOD AND WATER IN THE ANIMAL'S BODY

    A. BODY MAINTENANCE

    B. BODY GROWTH

    C. PRODUCTION

        (1) EGGS
        (2) MILK
        (3) WOOL
        (4) MEAT

    D. REPRODUCTION

2. IDENTIFYING THE FOOD NUTRIENTS AND THEIR FUNCTION IN THE BODY

    A. PROTEINS

- (1) DEFINING PROTEINS AND THE FUNCTIONS THEY SERVE IN THE BODY

    - (A) IDENTIFYING THE AMINO ACIDS THAT MAKE PROTEIN
    - (B) IDENTIFYING THE FUNCTIONS OF AMINO ACIDS IN THE BODY

- (2) DEFINING A HIGH AND LOW QUALITY PROTEIN

    - (A) SOURCES OF HIGH QUALITY PROTEIN
    - (B) SOURCES OF LOW QUALITY PROTEIN
    - (C) BALANCING PROTEIN QUALITY USING SEVERAL SOURCES OF BOTH HIGH AND LOW QUALITY PROTEIN
    - (D) ORGANIC AND INORGANIC SOURCES OF PROTEIN

- (3) DEFINING CRUDE PROTEIN AND DIGESTIBLE PROTEIN
- (4) DETERMINING RELATIONSHIP OF CRUDE PROTEIN AND DIGESTIBLE PROTEIN AS USED BY AN ANIMAL
- (5) READING AND INTERPRETING THE COMMON COMMERCIAL FEED TAG FOR PROTEIN CONTENT

B. CARBOHYDRATES

- (1) DEFINING CARBOHYDRATES AND THE FUNCTIONS THEY SERVE IN THE BODY

    - (A) IDENTIFYING THE PLANT COMPONENTS THAT MAKE UP CARBOHYDRATES
    - (B) IDENTIFYING THE FUNCTION THEY SERVE IN THE BODY

- (2) DEFINING HOW CARBOHYDRATES ARE MADE BY PLANTS THROUGH THE PROCESS OF PHOTOSYNTHESIS
- (3) DEFINING THE DRY MATTER CONTENT FOUND IN FEEDS
- (4) DEFINING THE TWO TYPES OF CARBOHYDRATES FOUND IN FEED

    - (A) IDENTIFYING THE "CRUDE FIBER" PORTION OF CARBOHYDRATE
    - (B) IDENTIFYING THE "NITROGEN-FREE-EXTRACT" (NFE) PORTION OF CARBOHYDRATES
    - (C) UTILIZATION OF "CRUDE FIBER" AND "NITROGEN-FREE-EXTRACT" BY VARIOUS FARM ANIMALS

        1. NON-RUMINANT USE
        2. RUMINANT USE

- (5) READING AND INTERPRETING THE COMMON COMMERCIAL FEED TAG FOR SOURCES OF CARBOHYDRATES

C. FATS

(1) DEFINING FATS AND THE FUNCTIONS THEY SERVE IN THE BODY
(2) DEFINING THE EFFECT OF FATS IN FEED PREPARATION

  (A) BINDING EFFECT FOR PELLETING
  (B) DUST REDUCTION
  (C) PALATABILITY OF FEED

(3) DETERMINING SOURCES OF FATS

  (A) PLANT SEEDS
  (B) ANIMAL PRODUCTS
  (C) ANIMAL BY-PRODUCTS

(4) READING AND INTERPRETING THE COMMON COMMERCIAL FEED TAG FOR FAT CONTENT

D. WATER

(1) IDENTIFYING THE FUNCTIONS THAT WATER SERVES IN THE BODY
(2) DETERMINING THE AVERAGE INTAKE OF WATER PER DAY OF LIVESTOCK
(3) DETERMINING THE IMPORTANCE OF PROVIDING FRESH CLEAN WATER TO LIVESTOCK EACH DAY

E. VITAMINS

(1) DEFINING VITAMINS AND THE GENERAL FUNCTIONS THEY SERVE IN THE BODY
(2) CLASSIFYING VITAMINS ACCORDING TO THEIR SOLUBILITY

  (A) DEFINING THE FAT-SOLUBLE VITAMINS A, D, E AND K

    1. SOURCES OF FAT-SOLUBLE VITAMINS
    2. THE MAJOR FUNCTIONS OF WATER-SOLUBLE VITAMINS

  (B) DEFINING THE WATER-SOLUBLE VITAMINS B-COMPLEX AND C

    1. THE MAJOR FUNCTIONS OF THE B-COMPLEX VITAMINS
    2. THE SOURCES OF VITAMINS B AND C

(3) DEFINING THE IMPORTANCE OF VITAMINS TO LIVESTOCK

        - (A) DEFINING THOSE THAT SHOULD BE GIVEN PARTICULAR ATTENTION
        - (B) DEFINING THE MAJOR SOURCES OF THESE VITAMINS

    - (4) READING AND INTERPRETING THE COMMON COMMERCIAL FEED TAG FOR VITAMIN CONTENT

  F. MINERALS

    - (1) DEFINING THE IMPORTANCE MINERALS PLAY IN LIVESTOCK FEEDING
    - (2) DEFINING THE MINERALS ESSENTIAL FOR ANIMAL LIFE
    - (3) DEFINING THE MINERALS NEEDED IN LARGE AMOUNTS BY LIVESTOCK

        - (A) CALCIUM
        - (B) PHOSPHORUS
        - (C) THE CALCIUM-PHOSPHORUS RATIO

    - (4) DEFINING THE TRACE MINERALS AND THEIR IMPORTANCE TO LIVESTOCK
    - (5) DEFINING THE GEOGRAPHICAL AREAS OF THE UNITED STATES THAT ARE DEFICIENT IN CERTAIN MINERALS OR SOURCES OF TOO MUCH OF CERTAIN MINERALS RESULTING IN TOXICITY PROBLEMS TO LIVESTOCK

    - (6) DEFINING THE SOURCES OF MINERALS
    - (7) DETERMINING HOW TO READ THE COMMON COMMERCIAL FEED TAG FOR MINERAL CONTENT

3. DETERMINING THE THREE MAJOR FUNCTIONS WHICH THE FOOD NUTRIENTS SERVE IN THE BODY

  A. IDENTIFYING THE ENERGY-SERVING NUTRIENTS

  B. IDENTIFYING THE STRUCTURAL-SERVING NUTRIENTS

  C. IDENTIFYING THE REGULATORY-SERVING NUTRIENTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS BRING INTO SCHOOL SAMPLES OF THE FEED SOURCES OF EACH NUTRIENT FROM THEIR HOME FARMS AND FEED STORES UPON COMPLETION OF THE TOPIC DEALING WITH EACH NUTRIENT. THEY CAN THEN PUT TOGETHER AN EXHIBIT OF THE SOURCES FROM WHICH FARM ANIMALS ARE SUPPLIED WITH THE FOOD NUTRIENTS. THIS COULD INCLUDE A POSTER BACKGROUND DEPICTING THE DIFFERENT MAJOR FOOD NUTRIENT GROUPS AND THEIR IMPORTANT FUNCTIONS IN

THE ANIMAL BODY. THIS METHOD WILL ALLOW THE CLASS TO BUILD THE EXHIBIT WITH THE FOCUS ON ONE NUTRIENT AT A TIME. THIS WILL BE EXCELLENT FOR THE FIRST YEAR OF VOCATIONAL AGRICULTURE WHERE MORE TIME COULD BE JUSTIFIED WITH EACH NUTRIENT.

B. GIVE THE STUDENT THE ASSIGNMENT TO FIND THE AVERAGE AMOUNT OF WATER NEEDED PER DAY OF THE COMMON FARM ANIMALS.

C. HAVE STUDENTS MAKE MAGAZINE REPORTS ON A TOPIC DEALING WITH ONE OF THE FOOD NUTRIENTS.

2. A. TAKE A FIELD TRIP TO THE LOCAL GRAIN ELEVATOR AND OBSERVE THE DIFFERENT SOURCES THAT ARE USED FOR THE VARIOUS FOOD NUTRIENTS. ASSIGN THE STUDENTS TO LIST THE SOURCES OF EACH NUTRIENT THAT ARE USED AT THE GRAIN ELEVATOR AND COMPARE THAT LIST TO THE SOURCES THEY USE AT THEIR HOME FARMS.

B. HAVE EACH STUDENT COLLECT FROM THEIR HOMES OR FROM THE FEED STORE (WITH THE PERMISSION OF THE MANAGER) SEVERAL DIFFERENT FEED TAGS AND THEN HAVE EACH STUDENT PRESENT TO THE CLASS THE INFORMATION FOUND ON ONE OF HIS FEED TAGS WITH EMPHASIS ON THE FOOD NUTRIENTS AND FEEDING DIRECTIONS, IF ANY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PAPER AND PENCIL TEST - HAVE THE STUDENTS LIST THE SIX MAJOR FOOD NUTRIENTS AND DESCRIBE THE FUNCTIONS EACH ONE SERVES IN THE BODY.

B. EACH STUDENT SHOULD BE EVALUATED ON HIS MAGAZINE REPORT ON THE TOPIC DEALING WITH THE FOOD NUTRIENTS.

2. A. EACH STUDENT'S PERFORMANCE EXPLAINING WHAT IS ON THE FEED TAG AND HOW TO INTERPRET THIS INFORMATION SHOULD BE EVALUATED.

B. IN A LABORATORY PRACTICAL EXAMINATION, THE TEACHER OR ANOTHER STUDENT SHOULD POINT TO CERTAIN TYPES OF FEED SUCH AS CORN, SOYBEANS, AND THE STUDENT BEING QUIZZED ORALLY SHOULD TELL THE MAJOR AND MINOR FOOD NUTRIENTS THAT THE PARTICULAR FOOD SUPPLIES.

C. THE REPORT THE STUDENT MAKES FROM THE FIELD TRIP TO THE FIELD ELEVATOR SHOULD BE EVALUATED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. COMMON REFERENCES AND CURRENT MAGAZINES THAT STUDENTS MAY USE AS RESOURCES ON THE TOPIC OF FOOD NUTRIENTS

2. DISPLAY AREA FOR FOOD NUTRIENT EXHIBIT

3. DISPLAY ITEMS - POSTER BOARD, THUMB TACKS, SCOTCH TAPE, CREPE PAPER, MAGIC MARKERS, LETTERS, STENCILS OF VARYING SIZES, SCISSORS

4. SEVERAL COMMONLY FOUND COMMERCIAL FEED TAGS

5. SEVERAL SAMPLES OF THE MORE HARD-TO-FIND SOURCES OF NUTRIENTS SUCH AS VITAMINS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ACKER, DUANE. ANIMAL SCIENCE AND INDUSTRY. 2ND EDITION. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL PUBLISHERS, INC. 53 PAGES.

   THIS REFERENCE PROVIDES A DISCUSSION WITH ILLUSTRATIONS RELATED TO THE FOOD NUTRIENTS AND NUTRITION IN GENERAL. IT COULD BE USED AS A STUDENT OR TEACHER REFERENCE.

2. ANIMAL NUTRITION HANDBOOK. ST. LOUIS, MISSOURI: RALSTON PURINA COMPANY. 1961, 39 PAGES.

   THIS PRESENTS BRIEF, TO-THE-POINT, DISCUSSION ON THE FUNDAMENTALS OF ANIMAL NUTRITION AND IS WRITTEN AT THE STUDENT LEVEL.

3. CRAMPTON, F. W. AND HARRIS, L. F. APPLIED ANIMAL NUTRITION. 2ND EDITION. SAN FRANCISCO, CALIFORNIA: W. H. FREEMAN AND COMPANY. 1961, 753 PAGES.

   THIS TEXT PROVIDES AN UP-TO-DATE THOROUGH DISCUSSION ON THE FOOD NUTRIENTS. IT IS WRITTEN MORE AT THE COLLEGE LEVEL SO IT SHOULD BE USED BASICALLY AS A TEACHER REFERENCE.

4. ENSMINGER, M. E. ANIMAL SCIENCE. 6TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1961, 1253 PAGES.

   THIS IS A STUDENT REFERENCE WRITTEN AT THE HIGH SCHOOL LEVEL. THE BOOK HAS A CHAPTER ABOUT THE FOOD NUTRIENTS IN GENERAL, THEN CHAPTERS ABOUT EACH SPECIES OF LIVESTOCK AND A FURTHER DISCUSSION OF NUTRITION AS IT RELATES TO THAT PARTICULAR LIVESTOCK.

5. FRANSON, R. D. ANATOMY AND PHYSIOLOGY OF FARM ANIMALS.
PHILADELPHIA, PENNSYLVANIA: LEA AND FEBIGER.
282 PAGES.

THIS TEXT IS A TEACHER REFERENCE GIVING AN IN-DEPTH VERY TECHNICAL EXPLANATION OF ANIMAL NUTRITION IN EVERY PHASE.

THE DIGESTION, ABSORPTION AND METABOLISM OF FOOD IN LIVESTOCK

UNIT CONCEPT: THE DIGESTION PROCESS IS DIFFERENT BETWEEN RUMINANTS AND NON-RUMINANTS. THE LIVESTOCK FEEDER WHO KNOWS HOW THEY DIFFER WILL TAKE ADVANTAGE OF THIS DIFFERENCE AND FEED HIS ANIMALS THE FEEDS THAT CAN BE USED MOST EFFICIENTLY BY THE ANIMALS HE IS FEEDING. THE RESULT WILL BE MORE EFFICIENT PRODUCTION OF MEAT, MILK OR WOOL AND, THEREFORE, MORE PROFIT PER ANIMAL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A DIAGRAM OF BOTH THE RUMINANT AND NON-RUMINANT MONO-GASTRIC DIGESTIVE SYSTEM, IDENTIFY ORALLY OR IN WRITING EACH PART AND EXPLAIN ITS FUNCTION IN THE DIGESTION PROCESS AS DEFINED BY A STANDARD REFERENCE ON THE SUBJECT.

2. CLASSIFY ORALLY OR IN WRITING THE ANIMALS FOUND ON HIS HOME FARM AS RUMINANT OR NON-RUMINANT BY THE DEFINITION PROVIDED IN A STANDARD REFERENCE ON THE SUBJECT.

3. WHEN GIVEN ANY ONE OF THE FOOD NUTRIENTS, EXPLAIN ORALLY OR IN WRITING THE PROCESSES THAT NUTRIENT WILL GO THROUGH DURING DIGESTION, ABSORPTION AND METABOLISM IN THE ANIMAL BODY IN ORDER TO INSURE A HEALTHY, GROWING ANIMAL.

4. DESCRIBE ORALLY OR IN WRITING THE RELATIONSHIP OF THE RUMINANT AND NON-RUMINANT DIGESTIVE TRACTS TO THE AMOUNTS OF ROUGHAGES AND CONCENTRATES WHICH SHOULD BE INCLUDED IN THE RATIONS TO INSURE NORMAL GROWTH IN BOTH THE RUMINANT AND NON-RUMINANT ANIMALS.

B. INSTRUCTIONAL AREAS

1. DEFINING THE TERMS

   A. DIGESTION

   B. ABSORPTION

   C. METABOLISM

D. IDENTIFYING THE INTERRELATIONSHIP OF THE DIGESTION, ABSORPTION AND METABOLISM PROCESSES IN THE BODY

2. EXAMINING THE MONO-GASTRIC DIGESTIVE TRACT

    A. DEFINING WHAT IT IS

    B. THE NON-RUMINANT TRACT - PARTS AND FUNCTION

    C. THE RUMINANT TRACT - PARTS AND FUNCTION

    D. IDENTIFYING DIFFERENCES IN NON-RUMINANT AND RUMINANT DIGESTIVE TRACTS

    E. IDENTIFYING RUMINANT DIGESTIVE TRACT WHEN FIRST BORN UNTIL RUMEN DEVELOPS

3. DETERMINING THE PROCESSES FEED NUTRIENTS GO THROUGH IN DIGESTION

    A. RUMINANTS

        (1) PROTEIN
        (2) CARBOHYDRATES
        (3) FATS
        (4) MINERALS
        (5) VITAMINS
        (6) WATER

    B. NON-RUMINANTS

        (1) PROTEIN
        (2) CARBOHYDRATES
        (3) FATS
        (4) MINERALS
        (5) VITAMINS
        (6) WATER

    C. IDENTIFYING THE PRODUCTS OF DIGESTION OF EACH NUTRIENT

4. DETERMINING THE PROCESSES THE FOOD NUTRIENTS GO THROUGH IN ABSORPTION

    A. IDENTIFYING WHERE AND HOW ABSORPTION OF NUTRIENTS TAKES PLACE IN NON-RUMINANTS

        (1) SMALL INTESTINE VILLI

            (A) PROTEIN
            (B) CARBOHYDRATES
            (C) FATS
            (D) MINERALS
            (E) VITAMINS
            (F) WATER

        (2) LARGE INTESTINE - WATER

    B. IDENTIFYING WHERE AND HOW ABSORPTION OF NUTRIENTS TAKES PLACE IN RUMINANTS

(1) RUMEN PAPILLAE
(2) SMALL INTESTINE VILLI

5. DETERMINING THE PROCESSES THE FOOD NUTRIENTS GO THROUGH IN METABOLISM IN BODY CELLS

A. PROTEIN

B. CARBOHYDRATES

C. FATS

D. VITAMINS

E. MINERALS

F. WATER

6. IDENTIFYING THE RELATIONSHIP OF THE DIGESTION PROCESS TO THE AMOUNTS OF CONCENTRATES AND ROUGHAGES TO INCLUDE IN THE RATION

A. DEFINING THE TERMS

(1) CONCENTRATES
(2) ROUGHAGES

B. DETERMINING AMOUNTS, ON PERCENTAGE BASIS, OF CONCENTRATES AND ROUGHAGES TO FEED RUMINANT ANIMALS

(1) CALVES AND LAMBS
(2) OLDER RUMINANTS
(3) OTHER RUMINANTS

C. DETERMINING AMOUNTS, ON PERCENTAGE BASIS, OF CONCENTRATES AND ROUGHAGES TO FEED NON-RUMINANT ANIMALS

(1) SWINE
(2) HORSES
(3) POULTRY
(4) OTHER NON-RUMINANTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. TAKE A FIELD TRIP TO A SLAUGHTER HOUSE AND OBSERVE AND COMPARE THE PARTS OF THE RUMINANT AND NON-RUMINANT DIGESTIVE TRACT. CUT OPEN THE RUMEN OF THE RUMINANT TRACT TO SEE THE PAPILLAE. CONTINUE TO EXAMINE OMASUM, RETICULUM ABOMASUM, SMALL INTESTINE, AND SO ON.

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRONOMY GUIDE. AVAILABLE FROM YOUR COOPERATIVE EXTENSION SERVICE.

   SECTIONS INCLUDED IN THESE PUBLICATIONS GENERALLY INCLUDE THE ESSENTIAL ELEMENTS FOR PLANT GROWTH, THE PRIMARY NUTRIENTS, THE SECONDARY NUTRIENTS, THE MICRO-NUTRIENTS, AND LIMING MATERIALS.

2. BE YOUR OWN CORN DOCTOR. WASHINGTON, D.C.: NATIONAL PLANT FOOD INSTITUTE. 4 PAGES.

   HELPFUL AS A STUDENT REFERENCE, THIS PAMPHLET PRESENTS COLORED ILLUSTRATIONS OF NUTRIENT DEFICIENCY SYMPTOMS FOUND IN THE LEAVES, ROOTS, AND EARS OF CORN.

3. THE FERTILIZER HANDBOOK. WASHINGTON, D.C.: THE FERTILIZER INSTITUTE.

   INCLUDED IN THIS PUBLICATION ARE SECTIONS WHICH DEAL WITH THE BASICS OF PLANT GROWTH, THE VARIOUS NUTRIENTS THAT ARE NEEDED FOR PLANT GROWTH, AND VARIOUS SOURCES OF MATERIALS AVAILABLE TO SUPPLY THE NUTRIENTS.

4. PLANNING A FERTILIZER PROGRAM. VAS 4010A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 8 PAGES.

   THIS REFERENCE COVERS THE IMPORTANCE OF FOLLOWING A GOOD FERTILIZATION PROGRAM AND PRESENTS INFORMATION REGARDING THE RESPONSES FROM USING LIMESTONE, PHOSPHORUS, AND POTASSIUM.

5. PLANNING THE NITROGEN PROGRAM. VAS 4009A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 16 PAGES.

   INCLUDED ARE SECTIONS WHICH COVER THE COMMON CARRIERS OF NITROGEN AND THE RELATIVE COSTS OF THE VARIOUS SOURCES.

6. RECOMMENDING POTASSIUM FERTILIZERS. VAS 4008A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 8 PAGES.

   INCLUDED IN THIS PUBLICATION IS A SECTION ON THE VARIOUS SOURCES OF POTASH FERTILIZERS.

7. SOIL LIMING - A KEY TO BETTER FARMING. VAS 4006A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 8 PAGES.

GET TO BODY CELLS

2. DISPLAY AREA FOR DIGESTION, ABSORPTION AND METABOLISM EXHIBIT

3. PROVIDE RUMEN FOR OBSERVATION - SHEEP EASIER TO HANDLE; CATTLE BIGGER, EASIER TO SEE

4. SEVERAL REFERENCES AND TEXT BOOKS THAT CONTAIN INFORMATION ON THE TOPIC

F. EXAMPLES OF SUPPORTING REFERENCES

1. ACKER, DUANE. ANIMAL-SCIENCE AND INDUSTRY. 2ND EDITION. ENGLEWOOD CLIFFS, NEW JERSEY: PRENTICE-HALL, INC. 1971, 604 PAGES.

   THIS REFERENCE PROVIDES A CHAPTER ON THE TOPIC OF DIGESTIVE AND METABOLIC SYSTEMS IN RUMINANTS AND NON-RUMINANTS WITH ILLUSTRATIONS. THIS BOOK COULD BE USED BY STUDENTS AS A REFERENCE.

2. 4-H ANIMAL SCIENCE BULLETINS, LESSONS 1-6. NO. AS-65. AMES, IOWA: COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY. APRIL, 1964.

   THESE BOOKLETS ARE WELL ILLUSTRATED AND COULD BE USED WHEN INTRODUCING THE TOPIC OF DIGESTION TO THE BEGINNING STUDENT.

3. FRANSON, R. D. ANATOMY AND PHYSIOLOGY OF FARM ANIMALS. PHILADELPHIA, PENNSYLVANIA: LEE AND FEBIGER. 1961, 501 PAGES.

   THIS BOOK PROVIDES AN EXTREMELY IN-DEPTH DISCUSSION ON THE TOPIC OF DIGESTION, ABSORPTION AND METABOLISM. RUMINANT AND NON-RUMINANT DIGESTIVE SYSTEMS ARE COMPARED AND DISCUSSED. THIS BOOK SHOULD BE CONSIDERED A TEACHER REFERENCE.

4. MORRISONS, FRANK B. FEEDS AND FEEDING. 22ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS. 1956, 1165 PAGES.

   THIS TEXT PROVIDES A CHAPTER ON DIGESTION, ABSORPTION AND METABOLISM IN RUMINANTS AND NON-RUMINANTS. IT MAY BE DIFFICULT FOR AVERAGE HIGH SCHOOL STUDENT TO READ.

SELECTION OF FEEDS ACCORDING TO NUTRITIVE VALUE

UNIT CONCEPT: IN ORDER TO CORRECTLY FORMULATE A BALANCED RATION ACCORDING TO THE NUTRITIVE REQUIREMENTS OF THE PARTICULAR ANIMALS BEING FED, A LIVESTOCK FEEDER MUST KNOW THE NUTRITIVE VALUE OF HIS HOME-GROWN FEEDS AS WELL AS OTHER PURCHASED FEEDS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A LIST CONTAINING ONE OR MORE OF THE COMMONLY USED FEEDSTUFFS AND A FEED COMPOSITION TABLE, ORALLY OR IN WRITING DETERMINE THE NUTRITIVE VALUE OF THE FEEDSTUFFS AS GIVEN BY A FEED COMPOSITION TABLE.

B. INSTRUCTIONAL AREAS

1. READING A FEEDSTUFF COMPOSITION TABLE

    A. DEFINING COMMON TERMS USED IN FEEDSTUFF COMPOSITION TABLES

        (1) ROUGHAGES
        (2) CONCENTRATES
        (3) ENERGY FEEDS
        (4) PROTEIN SUPPLEMENTS
        (5) DRY MATTER
        (6) TOTAL DIGESTIBLE NUTRIENTS (TDN)
        (7) NATIONAL RESEARCH COUNCIL (NRC) NOMENCLATURE
        (8) OTHER TERMS

    B. DEFINING ABBREVIATIONS USED IN FEEDSTUFF COMPOSITION TABLES

        (1) PERCENT - %
        (2) KILOCALORIC - KCAL
        (3) MILLIGRAMS/KILOGRAM - MG/KG
        (4) GRAM - G
        (5) INTERNATIONAL UNITS - IU
        (6) OTHER ABBREVIATIONS

    C. COMPARING THE INFORMATION NEEDED IN RELATION TO NUTRITIVE VALUE OF FEEDS FOR THE TDN AND NET ENERGY METHODS OF BALANCING RATIONS

        (1) DIGESTIBLE ENERGY/KG

(2) METABOLIZABLE ENERGY/KG
(3) TDN VALUE OF FEED
(4) RELATING HOW THE TWO SYSTEMS REALLY DIFFER IN TERMS OF INFORMATION PROVIDED IN FEED NUTRITIVE TABLES
(5) OTHER INFORMATION

2. DETERMINING THE AMOUNT OF DEVIATION OF INDIVIDUAL FEED SAMPLES FROM AVERAGE NUTRITIVE VALUES GIVEN IN ANY TABLE.

A. ANALYZING HOME-GROWN FEEDS FOR NUTRITIVE VALUE

(1) ADVANTAGES OF HAVING YOUR HOME-GROWN FEEDS ANALYZED
(2) DETERMINING THE PROCEDURES TO FOLLOW IN ORDER TO GET FEEDS ANALYZED AT STATE FEED TESTING LABORATORY
(3) SECURING COMMERCIAL FEED LABORATORY ANALYSIS SERVICES
(4) COLLECTING THE SAMPLE OF FEEDS
(5) SELECTING CONTAINER AND PREPARING FOR SENDING TO THE LABORATORY
(6) COMPLETING SAMPLE INFORMATION FOR LABORATORY
(7) INTERPRETATION OF RESULTS

3. DETERMINING HOW MUCH FEED COMPOSITION TABLE INFORMATION ON A PARTICULAR FEED IS NEEDED IN ORDER TO BALANCE A RATION CORRECTLY.

A. PLACING EMPHASIS ON THOSE NUTRIENTS THAT ARE KNOWN TO BE CRITICAL TO ANIMAL HEALTH

(1) PROTEINS
(2) CARBOHYDRATES
(3) MINERALS
(4) VITAMINS
(5) OTHER COMPONENTS

4. DETERMINING THE NUTRITIVE VALUE OF SEVERAL FEEDS COMMONLY USED IN RATIONS

A. CORN, BARLEY, OATS, MILO - COMMON LOCAL SOURCES OF ENERGY FEEDS

(1) TDN NUTRITIVE VALUES
(2) NET ENERGY NUTRITIVE VALUES

B. ALFALFA HAY, CORN SILAGE - COMMON LOCAL SOURCES OF ROUGHAGES

(1) TDN NUTRITIVE VALUES
(2) NET ENERGY VALUES

C. IDENTIFYING COMMON LOCAL SOURCES OF PROTEIN SUPPLEMENT FEEDS

(1) SOYBEAN OIL MEAL, LINSEED OIL MEAL, COTTONSEED OIL MEAL, DEHYDRATED ALFALFA, NON-PROTEIN NITROGEN (UREA)

(A) TDN NUTRITIVE VALUE
(B) NET ENERGY VALUE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE EACH STUDENT DETERMINE THE NUTRIENT VALUE OF EACH OF THE FEEDS BEING USED IN RATIONS AT HOME.

B. PROPERLY COLLECT A SAMPLE OF A FEED USED ON THE HOME FARM AND HAVE IT SENT TO A FEED COMPANY OR UNIVERSITY FOR PROXIMATE ANALYSIS. WHEN RESULTS RETURN, COMPARE TO FEED COMPOSITION VALUES. (THIS EXERCISE INVOLVES THE EXPENDITURE OF MONEY USUALLY FOR PROXIMATE ANALYSIS. ARRANGEMENT FOR THIS MIGHT BE DONE THROUGH FEED COMPANY NUTRITIONIST FOR LITTLE IF ANY COST, ESPECIALLY IF THEY HAVE A LARGE VOLUME OF SALES IN YOUR AREA.) STUDENTS MIGHT WORK IN GROUPS RATHER THAN ONE SAMPLE PER STUDENT.

C. HAVE A NUTRITIONIST FROM A LOCAL FEED COMPANY TALK TO THE CLASS ABOUT HOW THE NUTRITIVE VALUES OF FEEDS ARE DETERMINED AND WHY THESE VALUES ARE IMPORTANT TO RATION FORMULATION.

D. STUDY FEED COMPOSITION TABLES AND FIND THE NUTRITIVE VALUE, BOTH TDN AND NET ENERGY, FOR ANY FEEDSTUFF.

E. DISCUSS THE TERMS AND ABBREVIATIONS THAT ARE FOUND IN THE FEED COMPOSITION TABLES. MAKE SURE ALL STUDENTS UNDERSTAND THEIR MEANING.

F. HAVE A CLASS DISCUSSION INVOLVING A FEED NUTRITIONIST AND DETERMINE WHAT INFORMATION OUGHT TO BE INCLUDED IN THE NUTRITIVE VALUE OF A FEED. THE QUESTION SHOULD BE ASKED: IS IT NECESSARY TO LIST ALL OF THE MINERALS THAT ARE GIVEN IN A FEED COMPOSITION TABLE? VITAMINS?

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PAPER AND PENCIL TEST - GIVE THE STUDENTS A LIST OF SEVERAL FEEDSTUFFS AND HAVE THEM DETERMINE THE NUTRITIVE VALUE OF EACH USING ONE OR BOTH THE TDN AND NET ENERGY SYSTEMS. PROVIDE FEED COMPOSITION TABLES FOR THEM TO USE.

B. ASK THE STUDENT TO EXPLAIN ORALLY WHY THE NUTRITIVE VALUE OF FEEDS IS OR IS NOT IMPORTANT TO THE BALANCING OF RATIONS; AND ARE FEED COMPOSITION TABLES PREFERRED FOR USE OR NOT AS COMPARED TO AN ACTUAL PROXIMATE ANALYSIS OF HOME-GROWN FEEDS IN RELATION TO RATION FORMULATION?

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. REFERENCES WITH FEED COMPOSITION TABLES (UP-TO-DATE)

   A. TDN VALUES

   B. NET ENERGY VALUES

2. OVERHEAD PROJECTOR WITH TRANSPARENCIES OF NUTRITIVE VALUE OF SEVERAL FEEDSTUFFS COMMON TO THE AREA, PLUS OTHER TRANSPARENCIES TO AID IN STUDENT DISCUSSIONS ON TOPIC.

3. PROVIDE AT LEAST ONE PAGE OF A FEED COMPOSITION TABLE TO EACH STUDENT.

4. PROVIDE A FORM, SO THAT FIGURES TAKEN FROM FEED COMPOSITION TABLE MAY BE TRANSFERRED. THIS USUALLY IS A FORM USED FOR BALANCING RATIONS AND THE SECTION NEEDED HERE IS THE FEEDS AVAILABLE SECTION.

5. FROM THE FEED NUTRITIONIST OR FEED FIELDMAN, OBTAIN SAMPLE FEED BAGS IN ORDER TO MAIL SAMPLES, IF NECESSARY, TO PLACE WHERE PROXIMATE ANALYSIS CAN BE DONE. (USUALLY ALLOW ONE MONTH FOR RESULTS TO BE RETURNED.)

F. EXAMPLES OF SUPPORTING REFERENCES

1. CRAMPTON, F. W. AND HARRIS, L. F. APPLIED ANIMAL NUTRITION. SECOND EDITION. SAN FRANCISCO, CALIFORNIA: W. H. FREEMAN AND COMPANY. 1969.

   THIS REFERENCE DISCUSSES THE DIFFERENT FEEDSTUFFS VERY THOROUGHLY AND ALSO PROVIDES FEED COMPOSITION TABLES WITH BOTH TDN AND NET ENERGY FIGURES.

2. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. SECOND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1960, 667 PAGES.

   THIS BOOK MAY BE USED AS A GENERAL REFERENCE BUT DOES NOT DEAL WITH FEEDSTUFFS AS THOROUGHLY AS OTHERS MENTIONED. THE BOOK DOES PROVIDE FEED COMPOSITION TABLE WITH TDN FIGURES BUT HAS SKETCHY NET ENERGY FIGURES.

BALANCING RATIONS FOR LIVESTOCK

UNIT CONCEPT: EVEN THOUGH EACH OF THE INDIVIDUAL GRAINS, FORAGES OR OTHER FEEDSTUFFS CONTAIN MANY OF THE NUTRITIONAL ELEMENTS NEEDED BY LIVESTOCK, THEY RARELY, IF EVER, CONTAIN THE NUTRITIONAL ELEMENTS IN THE SAME RATIO AS NEEDED BY THE ANIMALS. AS A RESULT, FEEDING ONLY ONE TYPE OF FEED WOULD PROVIDE AN INADEQUATE SUPPLY OF SOME NUTRIENTS AND AN OVERSUPPLY OR WASTAGE OF OTHERS. BY A CAREFUL SELECTION AND BLENDING OF SEVERAL FEEDSTUFFS FOR EACH TYPE OF LIVESTOCK, THE LIVESTOCK PRODUCER CAN SEE THAT ALL NUTRIENTS ARE PROVIDED IN A RATIO NEEDED BY THE ANIMAL AND ALSO THAT THE MOST ECONOMICAL SOURCES OF EACH NUTRIENT ARE USED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A LIST CONTAINING SEVERAL FEEDS, BOTH HOME-GROWN AND COMMERCIAL AND THE COST OF EACH ALONG WITH A SPECIFIC CLASS OF ANIMALS TO FEED, DESIGN A LEAST-COST BALANCED RATION FOR THAT GROUP OF ANIMALS SO THAT IT IS APPROPRIATE FOR THE ANIMAL'S WEIGHT, SEX, AGE AND PRODUCTIVE PURPOSE.

B. INSTRUCTIONAL AREAS

1. DETERMINING A LEAST-COST BALANCED RATION FOR A SPECIFIC CLASS OF ANIMALS
    - A. IDENTIFYING THE METHOD TO USE IN BALANCING OF THE RATION
        - (1) TOTAL DIGESTIBLE NUTRIENTS (TDN)
        - (2) NET ENERGY
    - B. BALANCING THE RATION ACCORDING TO THE NUTRITIVE REQUIREMENTS FOR THE ANIMALS
        - (1) USING TABLES TO IDENTIFY VARIOUS LIVESTOCK NUTRITIVE REQUIREMENTS GIVEN
        - (2) DETERMINING SPECIFIC NEEDS OTHER THAN MAINTENANCE
            - (A) GESTATION NEEDS

- (B) LACTATION NEEDS
- (C) PRODUCTION NEEDS
- (D) REPRODUCTIVE MALE NEEDS
- (E) WORKING NEEDS

2. IDENTIFYING THE NUTRITIVE VALUE OF FEEDS THAT ARE AVAILABLE FOR USE IN A RATION ALONG WITH ACTUAL COST PER UNIT OF MAJOR NUTRIENT PROVIDED

   A. DETERMINING VALUE OF HOME-GROWN FEEDS

      (1) USING A FEED COMPOSITION TABLE
      (2) USING A SAMPLE ANALYSIS REPORT FROM STATE TESTING LABORATORY

   B. DETERMINING VALUE OF COMMERCIAL SUPPLEMENTS

      (1) USING INFORMATION INCLUDED ON A FEED TAG
      (2) OBTAINING MORE COMPLETE INFORMATION FROM MANAGER OF THE COMPANY WHERE THE FEED WAS PURCHASED
      (3) DETERMINING DIFFERENCE BETWEEN AN OVERZEALOUS SALES PRESENTATION BY FEED COMPANY SALESMAN AND ANIMALS' REAL NEEDS FOR A NUTRIENT OR FEED ADDITIVE

         (A) WHEN TO BASE DECISION ON NATIONAL RESEARCH COUNCIL (NRC) REQUIREMENT TABLES
         (B) WHEN TO BASE DECISION ON CONSULTATION WITH FEEDING SPECIALIST OR VETERINARIAN

3. IDENTIFYING OTHER IMPORTANT FACTORS THAT SHOULD BE CONSIDERED WHEN BALANCING RATIONS

   A. PALATABILITY OF RATION

   B. DIGESTIBILITY OF RATION

   C. BIOLOGICAL VALUE OF RATION

4. DETERMINING THE AMOUNT OF EACH FEED THAT WILL BE PUT INTO A LEAST-COST RATION

   A. TRIAL AND ERROR METHOD

   B. PEARSON SQUARE METHOD

   C. SIMULTANEOUS EQUATION METHOD

   D. OTHER METHODS

5. DETERMINING A LEAST-COST BALANCED RATION WITH THE USE OF A COMPUTER

A. WHAT IS COMPUTER RATION FORMULATION

B. HOW COMPUTER SYSTEM OPERATES

C. ADVANTAGES OF USING THE COMPUTER FOR RATION FORMULATION

D. DISADVANTAGES OF USING THE COMPUTER FOR RATION FORMULATION

E. IMPORTANCE OF COMPUTER BEING PROGRAMMED ACCURATELY

  (1) FEED PRICE FLEXIBILITY
  (2) NEED FOR LOWER OR UPPER BOUNDS ON CERTAIN FEED INGREDIENTS
  (3) GARBAGE IN-GARBAGE OUT THEORY

F. COST OF USING COMPUTER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE EACH STUDENT SELECT A PARTICULAR GROUP OF LIVESTOCK SUCH AS FEEDER CATTLE, YEARLING DAIRY HEIFERS, NATURE BEEF BROOD COWS, 30-LB. FEEDER PIGS, FOUND ON THEIR FARMS AND BALANCE A LEAST-COST RATION USING HOME-GROWN FEEDS AND COMMERCIAL SUPPLEMENTS, IF NECESSARY. THEN, WITH THE HELP OF FATHERS OR THE VOCATIONAL AGRICULTURE TEACHER, HAVE THEM FEED THIS RATION TO THESE ANIMALS AND KEEP RECORDS ON THEM.

B. HAVE STUDENT REPEAT ACTIVITY NUMBER ONE ON SAME LIVESTOCK EVERY TWO WEEKS, IF HIS LIVESTOCK ARE STILL GROWING. HAVE THOSE WHO SELECTED MATURE LIVESTOCK ORIGINALLY, UNLESS DAIRY CATTLE, BALANCE ANOTHER LEAST-COST RATION FOR SOME OTHER GROUP OF LIVESTOCK FOUND ON HIS FARM.

C. HAVE A FIELD TRIP OR ARRANGE FOR A NUTRITION SPECIALIST WITH A COMPUTER COMPONENT TO BE BROUGHT INTO CLASS TO DEMONSTRATE HOW TO USE THE COMPUTER FOR FIGURING LEAST-COST RATIONS. IF FIELD TRIP IS NECESSARY, CONTACT COUNTY AGENT OR FEED COMPANY REPRESENTATIVE IN YOUR AREA TO FIND WHERE YOU HAVE TO GO TO HAVE ACCESS TO COMPUTER.

D. HAVE STUDENTS PROGRAM A COMPUTER FOR LEAST-COST RATIONS FORMULATION. THIS COULD BE AN EXERCISE FOR SEVERAL INTERESTED OR COLLEGE-BOUND STUDENTS.

E. HAVE A CLASS DISCUSSION ON THE USE OF HOME-GROWN FEEDS IN THE RATION AND HOW TO DETERMINE THEIR COST OF PRODUCTION AND PROCESSING.

F. ASSIGN STUDENTS TO CALCULATE THE COST OF PRODUCTION AND PROCESSING OF THEIR HOME-GROWN FEEDS THAT ARE USED IN THEIR RATIONS.

G. HAVE A CLASS DISCUSSION ON RATION SUPPLEMENTATION, THE COMMON SOURCES AND FIGURING THE ACTUAL COST OF THE NUTRIENTS CONTAINED IN EACH.

H. HAVE A CLASS DISCUSSION ON WHY BALANCING LEAST-COST RATIONS IS SO IMPORTANT TO THE LIVESTOCK FEEDER. USE FACTS AND FIGURES BASED ON RESEARCH FINDINGS OR SOME LOCAL PRODUCERS OF LIVESTOCK. TALK ABOUT THE FIXED COSTS OF PRODUCTION AND THE VARIABLE COSTS OF PRODUCTION, AND POINT OUT THAT THE RATION IS ONE IMPORTANT AREA WHERE MONEY CAN BE SAVED.

I. HAVE STUDENTS REPORT ON HOW THE LIVESTOCK THEY ARE FEEDING THEIR RATION TO, ARE DOING - AVERAGE DAILY GAINS, PALATABILITY, AND SO ON.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. HAVE STUDENTS TURN IN RESULTS OF THEIR FEEDING TRIAL. SUCH RESULTS WILL HAVE LEAST-COST BALANCED RATION USED, AMOUNT OF RATION FED, AVERAGE DAILY GAIN OF LIVESTOCK OR MILK PRODUCTION FIGURES.

B. TEST STUDENTS ABILITY TO BALANCE LEAST-COST RATION FOR A SPECIFIC GROUP OF LIVESTOCK. USING HOME-GROWN FEEDS AND COMMERCIAL SUPPLEMENTS IF NEEDED, PROVIDE FEED COMPOSITION TABLES, LIVESTOCK NUTRIENT REQUIREMENT TABLES AND A HAND-OUT SHEET GIVING A LIST OF AVAILABLE FEEDS NOTING SUCH INFORMATION AS COST/TON AND PERCENT OF MAJOR NUTRIENTS PROVIDED FOR EACH FEED ON LIST.

C. STUDENTS THAT PROGRAM COMPUTER CAN HAVE THEIR PROGRAM AND PROCEDURES WHICH THEY USED EVALUATED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PROVIDE FEED COMPOSITION TABLES, LIVESTOCK NUTRIENT REQUIREMENT TABLES AND A FORM TO SYSTEMATICALLY LIST THE INFORMATION NEEDED IN ORDER TO BALANCE A LEAST-COST RATION. ONE FORM FOR TDN METHOD AND ONE FORM FOR NET ENERGY METHOD OR COMBINATION OF EACH METHOD FORM

2. HAVE OVERHEAD PROJECTOR WITH TRANSPARENCIES TO AID IN CLASS DISCUSSIONS ON RATION SUPPLEMENTS, USE OF HOME-GROWN FEEDS IN RATIONS AND THEIR COST OF PRODUCTION, WHY LEAST-COST BALANCED RATIONS ARE ECONOMICALLY IMPOR-

IMPORTANT, AND OTHER TRANSPARENCIES TO AID IN TASK OF BALANCING LEAST-COST RATIONS

3. PORTABLE SCALES (IF POSSIBLE) OR AT LEAST LIVESTOCK AND DAIRY CATTLE WEIGH TAPES IN ORDER TO WEIGH STUDENT'S LIVESTOCK BEING FED

4. USE OF A COMPUTER FOR FIGURING LEAST-COST BALANCED RATIONS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CRAMPTON, F. W. AND HARRIS, L. E. APPLIED ANIMAL NUTRITION. 2ND EDITION. SAN FRANCISCO, CALIFORNIA: W. H. FREEMAN AND COMPANY. 1969, 753 PAGES.

   THIS REFERENCE DEALS WITH ALL PHASES OF ANIMAL NUTRITION. FEED TABLES INCLUDE BOTH TDN AND NET ENERGY VALUES. THIS IS SUGGESTED TO BE USED AS AN INSTRUCTOR REFERENCE AS IT MAY BE TOO DIFFICULT FOR THE AVERAGE HIGH SCHOOL STUDENT.

2. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. 4TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1960, 667 PAGES.

   THIS REFERENCE PROVIDES ILLUSTRATIONS AND EXAMPLES ON HOW TO BALANCE ANIMAL RATIONS. IT IS APPROPRIATE FOR BOTH TEACHER AND STUDENT USE.

3. RAMSEY, HAROLD A. NUTRI-RITHMETIC. DUBUQUE, IOWA: KENDALL/HUNT PUBLISHING COMPANY. 1973, 163 PAGES.

   THIS IS A WORK BOOK DEALING WITH PRINCIPLES OF ANIMAL NUTRITION AND THE CALCULATIONS INVOLVED IN BALANCING RATIONS. BOTH TDN AND NET ENERGY METHODS OF BALANCING RATIONS ARE DISCUSSED. IT IS AN APPROPRIATE REFERENCE FOR TEACHER OR STUDENTS.

SUCCESSFUL FEEDING PROCEDURES FOR VARIOUS LIVESTOCK OPERATIONS

UNIT CONCEPT: THE TYPE(S) OF FEEDING METHOD(S) USED BY A LIVESTOCK FEEDER WILL DEPEND ON SEVERAL FACTORS SUCH AS THE TYPE OF LIVESTOCK HE IS FEEDING, THE PRODUCTIVE PURPOSE FOR WHICH HE IS FEEDING, THE SIZE OF HIS OPERATION, AND THE TYPE OF FEEDS HE IS FEEDING. EACH FARMER HAS TO DETERMINE THE FEEDING METHOD OR METHODS THAT WILL BEST FIT HIS PRODUCTION PROGRAM CONSIDERING ALL OF THE FACTORS RELATED TO HIS SITUATION AND INCLUDING THE VERY IMPORTANT FACTOR OF PROFIT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN AN EXAMPLE OF A NEWBORN OF ANY SPECIES OF LIVESTOCK FOUND ON THE HOME FARM, FOLLOW PRACTICES TO ASSURE THAT THE NEWBORN NURSES PROPERLY AND HAS PROPER FOOD AND WATER AVAILABLE OR, IF ORPHANED, THAT A FOSTER MOTHER OR PRECOLLECTED COLUSTRUM IS PROVIDED IN A SCHEDULE TO PROMOTE A HEALTHY START.

2. WHEN GIVEN AN ORPHAN OF ANY SPECIES OF LIVESTOCK FOUND ON THE HOME FARM, DEMONSTRATE A METHOD TO FEED THOSE ANIMALS SO THEY WILL SURVIVE AND GROW COMPARABLE WITH NON-ORPHANED ANIMALS OF THE SAME SPECIES.

3. WHEN GIVEN AN EXAMPLE OF A CERTAIN SPECIES OF YOUNG AND GROWING LIVESTOCK, EXPLAIN IN WRITING AND WITH THE USE OF SKETCHES WHERE AND HOW TO CONSTRUCT A CREEP FEEDER THAT WOULD BEST FIT INTO HIS HOME SITUATION.

4. FOR A GIVEN TYPE OF YOUNG GROWING STOCK, FORMULATE CREEP RATION THAT WILL BE PALATABLE AND PRODUCE ECONOMICAL GAINS TO THE LIVESTOCK.

5. FOR A GIVEN GROUP OF FINISHING LIVESTOCK FOUND ON THE HOME FARM, EXPLAIN ORALLY OR IN WRITING ONE OR MORE METHODS BY WHICH THEY MAY BE FED TO ASSURE ECONOMICAL GAINS FOR HIS HOME FARM SITUATION.

6. FOR A GIVEN GROUP OF MATURE LIVESTOCK FOUND ON THE HOME FARM, EXPLAIN ORALLY OR IN WRITING ONE OR MORE METHODS BY WHICH THEY MAY BE FED MOST ECONOMICALLY ON THE HOME FARM.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE FEEDING PROCEDURES BEST SUITED FOR NEWBORNS

   A. COLOSTRUM MILK FROM MOTHER

      (1) VALUE OF COLOSTRUM TO THE NEWBORN

         (A) VITAMIN LEVELS
         (B) ANTIBODIES CONTAINED IN COLOSTRUM

      (2) PERIOD WHEN THE COLOSTRUM IS SECRETED
      (3) INSURING THAT NEWBORN ESTABLISH NURSING
      (4) FREEZING COLOSTRUM MILK FOR EMERGENCY USE

   B. DETERMINING WHEN TO START FEEDING GRAIN AND/OR ROUGHAGE

      (1) AGES TO BEGIN FEEDING
      (2) PROCEDURES TO USE IN INTRODUCING GRAINS
      (3) PROCEDURES TO USE IN INTRODUCING ROUGHAGE

   C. FEEDING ORPHANED LIVESTOCK

      (1) TRANSFERING ORPHAN TO ANOTHER MOTHER
      (2) FEEDING MILK SUBSTITUTE
      (3) USING AUTOMATIC NURSER

   D. IDENTIFYING WHETHER TO HAND FEED OR AUTOMATIC FEED

      (1) VEAL FEEDING
      (2) DAIRY HEIFERS

2. PREPARATION OF FEEDS FOR MAXIMUM UTILIZATION

   A. GRINDING FEEDS

      (1) WHEN FINE GROUND FEED NEEDED
      (2) WHEN MEDIUM GROUND FEED NEEDED
      (3) WHEN COURSE GROUND FEED NEEDED
      (4) ADVANTAGES AND DISADVANTAGES OF GRINDING FEEDS

   B. CRUSHING OR CRIMPING FEEDS

      (1) WHEN FEEDS SHOULD BE CRUSHED OR CRIMPED RATHER THAN GROUND
      (2) ADVANTAGES AND DISADVANTAGES IN CRUSHING AND CRIMPING FEEDS

   C. STEAM ROLLING FEEDS

- (1) WHEN IS IT DESIRABLE TO STEAM ROLL FEEDS
- (2) ADVANTAGES AND DISADVANTAGES OF STEAM ROLLING

D. COOKING FEEDS

- (1) WHEN IS IT DESIRABLE TO COOK FEEDS
- (2) GARBAGE FED TO SWINE (LAW)
- (3) ADVANTAGES AND DISADVANTAGES

E. PELLETING FEEDS

- (1) CONCENTRATES
- (2) ROUGHAGES
- (3) COMPLETE RATION PELLETS
- (4) ADVANTAGES AND DISADVANTAGES OF PELLETS

F. WAFERING OR HAY CUBES

- (1) ADVANTAGES OF USING HAY WAFERS OR CUBES
- (2) DISADVANTAGES OF USING HAY WAFERS OR CUBES

3. DETERMINING THE FEEDING PROCEDURES FOR YOUNG AND GROWING LIVESTOCK

A. DETERMINING THE NURSING PERIOD

- (1) THE EFFECT ON MILK RETURNS FROM DAIRY CATTLE
- (2) REGULATING THE PERIOD OF NURSING TO ESTABLISH REBREEDING IN SWINE
- (3) PROLONGING NURSING FOR SPECIAL QUALITY MEATS - LAMB AND VEAL

B. DEFINING THE TECHNIQUE OF CREEP FEEDING

- (1) THE ADVANTAGES AND DISADVANTAGES OF CREEP FEEDING
- (2) DETERMINING WHETHER CREEP FEEDING WILL BE ECONOMICAL
  - (A) PUREBRED
  - (B) COMMERCIAL
- (3) THE CHARACTERISTICS OF RATIONS USED IN CREEP FEEDERS ACCORDING TO LIVESTOCK FED
- (4) IDENTIFYING THE DIFFERENT TYPES OF CREEP FEEDERS IN REGARD TO CONSTRUCTION AND LOCATION
- (5) DETERMINING THE TYPE OF CREEP FEEDER THAT WOULD FIT INTO EACH STUDENT'S HOME SITUATION

C. PASTURING YOUNG STOCK

- (1) THE ECONOMICS OF GAINS WHEN SUPPLEMENTING

PASTURE OF YOUNG STOCK WITH MOTHER'S MILK
(2) TYPES OF PASTURES MOST SUITABLE FOR YOUNG STOCK

D. FEEDING FOR BABY BEEF PRODUCTION

(1) DETERMINING WHEN THIS SYSTEM OF MANAGEMENT CAN BE USED ECONOMICALLY
(2) DETERMINING THE TYPES OF FEEDS AND FEED MIXTURES TO USE

E. FEEDING PROCEDURES USED TO FEED WEANED LIVESTOCK SPECIES OF THE LOCAL AREA

(1) PASTURE OR RANGE
(2) FEEDLOT

  (A) HAND FEEDING
  (B) SELF FEEDING
  (C) AUTOMATIC FEEDING

(3) FEED MIXTURE TO USE AND HOW TO MIX IT
(4) CLEANING MIXING EQUIPMENT BETWEEN BATCHES

  (A) PREVENT FREEZE-UP IN WINTER
  (B) WHEN DRUG-TYPE ADDITIVE IS CHANGED IN RATION

4. FEEDING PROCEDURES FOR MATURE LIVESTOCK

A. IDENTIFYING THE DIFFERENT FEEDING PROCEDURES TO FEED MATURE LIVESTOCK OF LOCAL AREA

(1) PASTURE FEEDING PROCEDURES

  (A) PASTURE ROTATION PROGRAM
  (B) ZERO GRAZING
  (C) SUPPLEMENT FEEDING OUTSIDE OF MILKING PARLOR FOR DAIRY CATTLE

    1. MAGNETIC FEEDERS
    2. GROUPING DAIRY CATTLE FOR ADDITIONAL SUPPLEMENT FEEDING

      A. HIGH PRODUCERS
      B. AVERAGE PRODUCERS
      C. LOW PRODUCERS

(2) WINTER FEEDING PROCEDURES

  (A) HAND FEEDING

1. HAY
2. SILAGE
3. SUPPLEMENT

(B) SELF FEEDING

1. HAY
2. SILAGE
3. SUPPLEMENT
4. MIXING PROCEDURES FOR FEEDS - CLEANING MIXING EQUIPMENT BETWEEN BATCHES

   A. PREVENT FREEZE-UP IN WINTER
   B. WHEN DRUG-TYPE ADDITIVE IS CHANGED IN RATION

5. DETERMINING THE FEEDING PROCEDURES FOR FINISHING LIVESTOCK

   A. IDENTIFYING FEEDING PROCEDURES FOR FINISHING LIVESTOCK SPECIES OF LOCAL AREA

      (1) FEEDLOT PROCEDURES FOR MIXING AND FEEDING RATIONS

         (A) HAND FEEDING SYSTEMS
         (B) AUTOMATIC FEEDING SYSTEMS
         (C) SELF FEEDING SYSTEMS
         (D) OTHER FEEDING SYSTEMS

      (2) FEEDLOT AND PASTURE PROCEDURES

6. USING FEED ADDITIVES IN LIVESTOCK RATIONS

   A. THE FUNCTION OF CHEMICAL FEED ADDITIVES

      (1) ANTIBIOTICS - ADVANTAGES AND DISADVANTAGES
      (2) GROWTH STIMULANTS - ADVANTAGES AND DISADVANTAGES

   B. FEEDS THAT MAY BE CONSIDERED AS ADDITIVES AND THEIR FUNCTIONS

      (1) MOLASSES
      (2) ALFALFA LEAF MEAL

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. TAKE A FIELD TRIP TO A FARM WHERE BIRTH IS JUST ABOUT TO OR HAS ALREADY OCCURRED. OBSERVE THE NORMAL BEHAVIOR PATTERNS THAT THE ANIMALS EXHIBIT. EXPLAIN WHEN THE NEWBORN SHOULD GET AROUND TO NURSE THE MOTHER.

DEMONSTRATE PROCEDURES THAT WILL HELP THE YOUNG NURSE, IF IT IS SLOW TO CATCH ON.

B. TAKE THE CLASS ON A FIELD TRIP TO A FEW LOCAL FARMS THAT HAVE GOOD EXAMPLES OF DIFFERENT FEEDING PROCEDURES. HAVE OWNERS DISCUSS WITH THE CLASS THE ADVANTAGES AND DISADVANTAGES THEY HAVE FOUND IN THEIR SYSTEM. IF POSSIBLE, HAVE THE OWNER DISCUSS THE ECONOMICS OF HIS SETUP NOW AS COMPARED TO HIS OLD METHOD OF FEEDING. HAVE EACH STUDENT TURN IN A REPORT ON THIS FIELD TRIP.

2. PROVIDE THE STUDENT WITH THE OPPORTUNITY TO TEACH A SELECTED TYPE OF ANIMAL TO DRINK FROM A PAIL, NIPPLE OR REGULAR PAIL, NIPPLE BOTTLE OR OTHER TYPE OF NURSER APPROPRIATE FOR THAT TYPE OF LIVESTOCK. THIS COULD BE DONE AT THE HOME FARM AS THE OPPORTUNITY PRESENTS ITSELF.

3. PREPARE AND PRESENT A SLIDE PROGRAM SHOWING THE TYPES OF CREEP FEEDERS USED ON FARMS IN THE STUDENT'S GEOGRAPHICAL LOCATION. DISCUSSION SHOULD INCLUDE POINTS ABOUT CONSTRUCTION MATERIALS USED IN EACH FEEDER SHOWN AND THE REASON THE FEEDER IS LOCATED WHERE IT IS.

4. HAVE THE STUDENT DETERMINE THE NUMBER OF DIFFERENT CREEP FEEDING RATIONS THAT COULD BE SUCCESSFULLY USED ON HIS FARM. HAVE HIM COMPILE THE FORMULA FOR EACH OF THESE IN HIS NOTEBOOK.

5. HAVE THE STUDENTS SELECT A SPECIFIC GROUP OF FINISHING LIVESTOCK THAT ARE FOUND ON THEIR HOME FARMS. ASSIGN EACH STUDENT TO PLAN AND ILLUSTRATE AN AUTOMATIC FEEDING SYSTEM FOR HIS LIVESTOCK USING AS MUCH AS POSSIBLE THE EXISTING LOTS AND STRUCTURES THAT ARE NOW PRESENT ON HIS FARM.

6. A. HAVE THE STUDENT DEVELOP A PASTURE CROP ROTATION PROGRAM FOR THE USE OF THE LIVESTOCK FOUND ON HIS HOME FARM. HE SHOULD TAKE INTO CONSIDERATION THE NUMBER OF LIVESTOCK, THE TOTAL ACREAGE OF PASTURE LAND, THE ACRES AND TYPES OF EACH CROP IN THE ROTATION GROWN, AND THE LENGTH OF TIME THE LIVESTOCK WILL BE ALLOWED TO GRAZE EACH CROP.

B. HAVE EACH STUDENT ORALLY EXPLAIN HOW HE THINKS THE LIVESTOCK THAT ARE FOUND ON HIS HOME FARM WILL BE FED IN THE FUTURE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENT DEMONSTRATE HIS ABILITY TO GET A NEWBORN CALF TO NURSE A BALKY MOTHER. THERE ARE SEVERAL

PROCEDURES THE STUDENT MAY USE TO GET THIS JOB DONE, DEPENDING ON THE SITUATION. THE IMPORTANT POINT IS TO GET THE JOB DONE AS QUICKLY AND QUIETLY AS POSSIBLE WITH THE LEAST POSSIBLE STRESS TO MOTHER, CALF AND STUDENT.

2. MANY TIMES, ORPHANED LIVESTOCK MAY BE PLACED AND ACCEPTED WITH ANOTHER MOTHER. HAVE THE STUDENT DEMONSTRATE HIS ABILITY TO GET A MOTHER TO ACCEPT AN ORPHANED ANIMAL. AGAIN THERE ARE MANY PROCEDURES HE MAY USE. THIS EVALUATION PROCESS MAY TAKE SEVERAL DAYS TO ACCOMPLISH.

3. HAVE EACH STUDENT PREPARE A RATIONALE AND DESIGN FOR A CREEP FEEDER ON HIS HOME FARM. SOME POINTS TO CONSIDER WOULD BE: IS MATERIAL USED FOR CONSTRUCTION ECONOMICAL AND DURABLE? DOES THE STRUCTURE FIT THE LIVESTOCK THAT WILL USE IT? COULD THE CREEP FEEDER BE MORE DESIRABLY LOCATED ON THE FARM?

4. EACH STUDENT'S PROPOSED CREEP RATION SHOULD BE EVALUATED BY THE TEACHER AND OBSERVATIONS OF REACTIONS OF THE LIVESTOCK FOR ACCEPTABILITY. THE STUDENT SHOULD STRIVE FOR DESIRABLE ADDITIONAL GAIN ON LIVESTOCK AT ECONOMICAL PRICE PER POUND OF GAIN.

5. EVALUATION CAN BE MADE OF THE FINISHING LIVESTOCK FEEDING SYSTEM. EMPHASIS IN GRADING SHOULD BE PLACED ON QUESTIONS SUCH AS: DOES THE SYSTEM FIT WELL INTO THE EXISTING SITUATION? IS THE SYSTEM PRACTICAL AND ECONOMICAL AND WITHIN THE REALM OF REALITY IN EACH STUDENT'S HOME FARM SITUATION?

6. HAVE EACH STUDENT REPORT ABOUT HIS PROPOSED PASTURE CROP ROTATION SYSTEM. DISCUSSION SHOULD BE ENCOURAGED TO BRING OUT STRENGTHS AND WEAKNESSES OF EACH PROPOSAL. THIS GIVES EACH STUDENT THE CHANCE TO EXPRESS HIMSELF BEFORE A GROUP AND EXCHANGE IDEAS ABOUT THE PROPOSAL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. REFERENCES AND MAGAZINES THAT PROVIDE INFORMATION ON FEEDING PROCEDURES

2. OVERHEAD PROJECTOR AND TRANSPARENCIES PROVIDED TO AID IN DISCUSSIONS ON TOPIC

3. MOVIE AND SLIDE PROJECTORS ALONG WITH SCREEN TO SHOW REAL EXAMPLES OF FEEDING SYSTEMS

4. GRAPH PAPER TO AID STUDENT IN DIAGRAMMING HIS PROPOSED FEEDING SYSTEM TO SCALE

F. EXAMPLES OF SUPPORTING REFERENCES

1. CRAMPTON, F. W. AND HARRIS, L. F. APPLIED ANIMAL NUTRITION. 2ND EDITION. SAN FRANCISCO, CALIFORNIA: W. H. FREEMAN AND COMPANY. 1969, 753 PAGES.

   CHAPTER 21 PROVIDES A REFERENCE ON LIVESTOCK FEEDING FOR SUCH THINGS AS DAILY ALLOWANCE TO FEED ANIMALS AND GUIDES TO DAIRY CATTLE FEEDING. RULES OF THUMB OF FEEDING YOUNG DAIRY CATTLE ARE DISCUSSED ALONG WITH SIMILAR INFORMATION OR SWINE AND HORSES. THIS IS A TEACHER REFERENCE AS IT IS MORE DESIGNED AS A COLLEGE TEXT.

2. ENSMINGER, M. E. ANIMAL SCIENCE. 6TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

   ALONG WITH A SEPARATE CHAPTER ON GENERAL INFORMATION ON FEEDING LIVESTOCK, THIS BOOK ALSO HAS A CHAPTER ON FEEDING IN EACH SECTION DEALING WITH BEEF CATTLE, DAIRY CATTLE, SHEEP, SWINE, POULTRY AND HORSES.

3. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. 2ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1960, 667 PAGES.

   A STUDENT REFERENCE THAT CONTAINS A SECTION ON FEEDING LIVESTOCK, THIS COVERS ABOUT EVERYTHING THAT DEALS WITH FEEDING WITH THE EXCEPTION OF INFORMATION ON AUTOMATIC FEEDING PROCEDURES.

4. FINISHING BEEF CATTLE. FARMER'S BULLETIN NO. 2196. WASHINGTON, D.C.: SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE. 1973, 29 PAGES.

   THIS REVISED EDITION PROVIDES SOME VERY UP-TO-DATE INFORMATION ON FEEDING BEEF CATTLE. SOME TOPICS AS CATTLE FEEDING SYSTEMS, KINDS OF CATTLE TO FEED, FEEDING PROCEDURES AND GETTING CATTLE ON FEED, FINISHING FEEDS AND PREPARING FEEDS ARE DISCUSSED IN THIS PUBLICATION.

5. MORRISONS, FRANK B. FEEDS AND FEEDING. 22 EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1956, 1165 PAGES.

   THIS TEXT CONTAINS A SECTION OF THIRTEEN CHAPTERS ON FEEDING FARM ANIMALS THAT INCLUDES DAIRY AND BEEF CATTLE, SHEEP, HORSES AND MULES, SWINE AND POULTRY.

LEGAL IMPLICATIONS OF FEED ADDITIVES

UNIT CONCEPT: WHEN USED CORRECTLY, FEED ADDITIVES CAN HELP KEEP ANIMALS IN A HEALTHY CONDITION AND INCREASE THE QUANTITY AND EFFICIENCY OF LIVESTOCK PRODUCTION. HOWEVER, THE LIVESTOCK FEEDER MUST KEEP INFORMED ABOUT THE REGULATIONS OF THOSE FEED ADDITIVES IN HIS FEEDING PROGRAM AND INSURE THAT THEY ARE NOT USED INCORRECTLY WHICH COULD HAVE AN ADVERSE EFFECT UPON EITHER THE ANIMALS THEY ARE FED TO OR THOSE WHO CONSUME THE ANIMAL PRODUCTS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DEFINE THE AGENCIES WHICH REGULATE THE USE OF FEED ADDITIVES AND EXPLAIN THE PROCESSES FOR SECURING THE INFORMATION OR REGULATIONS PERTAINING TO FEED ADDITIVES WHICH ARE TO BE USED IN HIS LIVESTOCK FEEDS.

2. WHEN GIVEN A SPECIFIC CLASS OF LIVESTOCK AND USING THE REGULATIONS SECURED FROM THE FOOD AND DRUG ADMINISTRATION AND ENVIRONMENTAL PROTECTION AGENCY, DEFINE THOSE FEED ADDITIVES WHICH ARE APPROVED.

3. INTERPRET LABEL INFORMATION ON FEED ADDITIVES WELL ENOUGH SO THAT HE CAN EITHER FOLLOW FEEDING PROCEDURES OR EXPLAIN THEM TO INSURE THE SAFE USE OF THE ADDITIVE TO ANIMAL AND CONSUMER.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE NEED FOR REGULATING THE USE OF FEED ADDITIVES
   - A. DETRIMENTAL EFFECTS TO ANIMAL
   - B. DETRIMENTAL EFFECTS TO CONSUMER
2. IDENTIFYING THE REGULATORY AGENCIES CONTROLLING FEED ADDITIVES
   - A. STATE REGULATIONS - DEPARTMENT OF AGRICULTURE
   - B. FEDERAL REGULATIONS

    (1) FEDERAL FOOD AND DRUG ADMINISTRATION
    (2) ENVIRONMENTAL PROTECTION AGENCY

3. SELECTING APPROVED FEED ADDITIVES

   A. DEFINING "OLD DRUG" AND "NEW DRUG" POLICIES

   B. FOOD AND DRUG ADMINISTRATION'S POLICY FOR "NEW DRUG" APPROVAL

   C. DETERMINING PROCEDURE TO FOLLOW IN USING "OLD DRUG" IN RATIONS

      (1) NO PRIOR APPROVAL NEEDED (FDA)
      (2) USED ACCORDING TO DIRECTIONS

   D. DETERMINING THE USEFUL PURPOSE OF THE DRUG

4. DETERMINING THE SAFE USE OF FEED ADDITIVES

   A. KEEPING ACCURATE RECORDS ON DRUGS OR OTHER FEED ADDITIVES USED

   B. READING THE LABEL

   C. OBSERVING THE WARNING STATEMENTS

   D. IDENTIFYING WHEN TO WITHDRAW DRUG FROM RATION PRIOR TO MARKETING LIVESTOCK

   E. PROPER STORAGE OF ADDITIVES

5. INTERPRETING THE CHEMICAL AND TRADE NAME OF THE VARIOUS DRUGS ON THE MARKET

6. KEEPING UP-TO-DATE ON INFORMATION AND/OR REGULATIONS FROM STATE OR FDA PERTAINING TO FEED ADDITIVES

   A. NEWLY APPROVED DRUGS OR OTHER FEED ADDITIVES THAT MAY BE USED - SELENIUM

   B. OLD DRUGS OR OTHER FEED ADDITIVES PROHIBITED FROM USE

   C. RECOMMENDATIONS ON DOSAGE CHANGES

   D. OTHER INFORMATION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. TAKE A FIELD TRIP TO THE STATE DEPARTMENT OF AGRICULTURE OR MAKE ARRANGEMENTS FOR REPRESENTATIVE TO COME OUT AND

TALK TO THE CLASS ABOUT THE FUNCTION OF THE DEPARTMENT OVER FEED ADDITIVES. THIS COULD BE DONE WITH A FEDERAL DRUG ADMINISTRATION REPRESENTATIVE, IF AVAILABLE.

2. HAVE THE STUDENTS CLASSIFY THE COMMON FEED ADDITIVES USED IN YOUR AREA INTO "NEW DRUG" OR "OLD DRUG" CATEGORIES. HAVE EACH STUDENT NOTE THAT ANY ADDITIVE FALLING INTO THE "NEW DRUG" CATEGORY CANNOT BE USED IN A FEED UNTIL WRITTEN PERMISSION IS SECURED FROM THE FEDERAL FOOD AND DRUG ADMINISTRATION.

3. A. THE STUDENTS CAN COLLECT SMALL SAMPLES OF THE DIFFERENT FEED ADDITIVES USED IN THEIR GEOGRAPHICAL AREA. THESE MAY BE OBTAINED FROM THEIR HOME FARM OR AT THE LOCAL GRAIN ELEVATOR OR STORE. EACH STUDENT WILL ALSO BE RESPONSIBLE FOR THE INFORMATION ON THE LABEL OR CONTAINER OF EACH ADDITIVE. THIS COULD BE COMPOSITED INTO AN EXHIBIT OR DISPLAY.

   B. HAVE STUDENTS FIND OUT WHETHER THE FEEDS THEY USE AT HOME CONTAIN "DRUGS." IF SO, HAVE EACH STUDENT LIST THE DRUGS' NAMES, USEFUL PURPOSES, DOSAGES, WARNING STATEMENTS, IF ANY, AND WITHDRAWAL PERIODS PRIOR TO MARKETING OF LIVESTOCK.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DO A FIELD TRIP REPORT ON THE STATE DEPARTMENT OF AGRICULTURE TRIP. THE STUDENT SHOULD DESCRIBE THE REGULATORY FUNCTION OF THE STATE DEPARTMENT OF AGRICULTURE AND THE FEDERAL DRUG ADMINISTRATION PERTAINING TO FEED ADDITIVES AND PREPARE A LETTER REQUESTING THE LATEST FEED ADDITIVE INFORMATION.

2. THE STUDENT WILL LIST THOSE FEED ADDITIVES THAT ARE CLASSIFIED AS "NEW DRUGS" AND EXPLAIN THE PROPER PROCEDURE TO GO THROUGH BEFORE THEY COULD USE NEW DRUGS IN A LIVESTOCK RATION.

3. HAVE THE STUDENT MIX A FEED ADDITIVE INTO A FEED FOLLOWING THE DIRECTIONS ON THE LABEL. HE SHOULD PERFORM ALL NECESSARY COMPUTATIONS CORRECTLY TO GET THE EXACT AMOUNT INTO THE RATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CONTAINERS FOR THE DIFFERENT DRUG SAMPLES COLLECTED BY THE CLASS WHICH ALLOW THE MATERIALS TO BE OBSERVED AND ALSO PROVIDE SECURE CONTAINMENT

2. REFERENCE BOOKLETS AND ARTICLES ON RESEARCH PERTAINING TO FEED ADDITIVES USED IN ANIMAL RATIONS

3. OVERHEAD PROJECTOR AND TRANSPARENCIES SHOWING THE VARIOUS INFORMATION RELATED TO FEED ADDITIVES

4. COPIES OF STATE AND FEDERAL LAWS PERTAINING TO FEED ADDITIVES

F. EXAMPLES OF SUPPORTING REFERENCES

1. MEDICATED FEED ADDITIVES. BULLETIN 474. COLUMBUS, OHIO: COOPERATIVE EXTENSION SERVICE, THE OHIO STATE UNIVERSITY. 1966, 19 PAGES.

   THIS BOOKLET PROVIDES INFORMATION THAT WILL BE USEFUL TO STUDENTS. IT STARTS WITH A GENERAL DISCUSSION ON DRUG USE IN AGRICULTURE FOLLOWED BY PROCEDURES TO FOLLOW IN OBTAINING PERMISSION TO USE DRUGS IN FEEDS. AFTER DISCUSSION ON SAFE USE OF FEED ADDITIVES, THE BALANCE OF THE BOOKLET IS IN CHART FORM DISCUSSING THE VARIOUS FEED ADDITIVES IN RELATION TO NAME, DOSAGE, USEFUL PURPOSE, LIMITATIONS, AUTHORIZED TREATMENT PERIOD, WITHDRAWAL PERIOD AND SPECIAL PRECAUTIONS.

2. STATE DEPARTMENT OF AGRICULTURE SHOULD BE ABLE TO PROVIDE INFORMATION BULLETIN ON RULES AND REGULATIONS ON FEED ADDITIVES.

ACUTE HEALTH DISORDERS RELATED TO NUTRITION

UNIT CONCEPT: CERTAIN HEALTH DISORDERS CAN BE CAUSED BY INADEQUATE FEEDING AND DEVELOP BY DEGREES NOT EASILY DETECTED IN THE EARLY STAGES, BUT MAY BE ADVERSELY AFFECTING FACTORS SUCH AS FEED EFFICIENCY, AVERAGE DAILY GAIN OR MILK PRODUCTION. SINCE THESE DISORDERS CAN CAUSE CONSIDERABLY LARGE ECONOMIC LOSSES IN THEIR HARD-TO-DETECT STAGES, IT IS IMPORTANT THAT THE LIVESTOCK PRODUCER BE AWARE OF THE EFFECT OF NUTRITION UPON THE HEALTH OF THEIR ANIMALS AND STRESS PREVENTION OF THE DISORDERS THROUGH AN ADEQUATE FEEDING PROGRAM.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING LIVESTOCK OR SLIDES AND PICTURES, IDENTIFY:
    - A. THE SYMPTOMS ANIMALS WILL EXHIBIT OR PROBLEMS CAUSED BY INSUFFICIENT DRINKING WATER AND RECOMMEND METHODS OF PROVIDING AN ADEQUATE QUANTITY AND QUALITY OF WATER,
    - B. THE SYMPTOMS THE ANIMALS WILL EXHIBIT OR PROBLEMS CAUSED BY INSUFFICIENT PROTEIN BEING PROVIDED IN THEIR RATION AND RECOMMEND METHODS OF PREVENTING PROTEIN DEFICIENCY,
    - C. THE SYMPTOMS THE ANIMALS WILL EXHIBIT OR PROBLEMS CAUSED BY TOO MUCH UREA USED IN THE RATION AND RECOMMEND A METHOD TO INSURE THAT THE LIVESTOCK WILL NOT BE AFFECTED,
    - D. THE SYMPTOMS THE ANIMALS WILL EXHIBIT OR PROBLEMS CAUSED BY INSUFFICIENT CARBOHYDRATES PROVIDED IN THE RATION AND RECOMMEND A METHOD TO INSURE THAT THE ANIMALS WILL NOT BE AFFECTED, AND
    - E. THE SYMPTOMS THE ANIMAL WILL EXHIBIT OR PROBLEMS CAUSED BY INFERIOR QUANTITY AND QUALITY OF THE TOTAL RATION AND RECOMMEND A METHOD TO INSURE THE ANIMAL WILL NOT BE AFFECTED.

2. USING LIVESTOCK OR PICTURES AND SLIDES, IDENTIFY THE SYMPTOMS THAT FEEDER LAMBS WILL EXHIBIT AS A RESULT OF OVER-EATING OF CARBOHYDRATES IN RATION AND RECOMMEND

A METHOD OF PREVENTION TO INSURE THAT THE LAMBS WILL NOT BE AFFECTED.

3. FOR THE LOCAL AREA, DEFINE THE MINERALS THAT ARE KNOWN TO BE OVER-ABUNDANT OR DEFICIENT AND DESCRIBE THE SYMPTOMS OR PROBLEMS CAUSED BY A DEFICIENCY OR TOXIC LEVEL OF THESE MINERALS AND RECOMMEND PREVENTIVE METHODS.

4. USING LIVESTOCK OR PICTURES AND SLIDES, IDENTIFY THE DEFICIENCY SYMPTOMS OF THE VITAMINS THAT ARE KNOWN TO BE DEFICIENT IN THE GEOGRAPHICAL AREA IN WHICH HE LIVES AND RECOMMEND PREVENTIVE METHODS TO INSURE THAT HIS LIVESTOCK DO NOT BECOME AFFECTED.

5. GIVEN THE RUMINANT LIVESTOCK FOUND ON THE HOME FARM, IDENTIFY THE SYMPTOMS THEY EXHIBIT WHEN BLOATED AND RECOMMEND PREVENTIVE FEEDING PROCEDURES TO INSURE THAT THE ANIMALS WILL NOT BE AFFECTED.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE IMPORTANCE OF PROVIDING PLENTY OF FRESH CLEAN WATER TO ALL CLASSES OF LIVESTOCK

   A. SYMPTOMS WHEN LIVESTOCK DOES NOT RECEIVE ENOUGH WATER

   B. PROCEDURES TO FOLLOW TO ASSURE ANIMALS GET PLENTY OF WATER

2. IDENTIFYING HEALTH DISORDERS RELATED TO PROTEIN SUPPLY IN RATION

   A. CAUSE AND CHARACTERISTICS OF DISORDER WHEN ANIMALS ARE FED A RATION DEFICIENT IN PROTEIN

      (1) SYMPTOMS WHEN ANIMALS ARE FED TOO LITTLE PROTEIN
      (2) FEEDING PROCEDURES TO PREVENT DEFICIENCY OF PROTEIN
      (3) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE

   B. CAUSE AND CHARACTERISTICS OF DISORDER WHEN RUMINANT IS FED TOO MUCH UREA IN RATION

      (1) SYMPTOMS WHEN RUMINANTS ARE FED TOO MUCH UREA IN RATION
      (2) FEEDING PROCEDURES TO PREVENT OVERUSE OF UREA IN RATION
      (3) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE

C. CAUSE AND CHARACTERISTICS OF DISPLACED ABOMASUM

(1) SYMPTOMS WHEN RUMINANTS ARE FED HIGH LEVELS OF CONCENTRATES
(2) FEEDING PROCEDURES TO PREVENT DISPLACED ABOMASUM
(3) TREATMENT PROCEDURES TO USE IF NEEDED

3. IDENTIFYING HEALTH DISORDERS RELATED TO SUPPLY OF CARBOHYDRATES IN RATION

A. CAUSE AND CHARACTERISTICS OF DISORDER WHEN ANIMALS DO NOT RECEIVE ENOUGH CARBOHYDRATES IN RATION

(1) SYMPTOMS EXHIBITED BY ANIMALS NOT RECEIVING ENOUGH CARBOHYDRATES IN RATION
(2) FEEDING PROCEDURES TO PREVENT CARBOHYDRATES DEFICIENCY IN LIVESTOCK
(3) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE

B. IDENTIFYING ENTEROTOXEMIA (OVER-EATING DISEASE) IN SHEEP

(1) CAUSE AND CHARACTERISTICS OF ENTEROTOXEMIA
(2) SYMPTOMS OF OVER-EATING DISEASE
(3) PROCEDURES USED TO PREVENT ENTEROTOXEMIA

(A) FEEDING
(B) VACCINATION

(4) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE

C. IDENTIFYING KETOSIS (ACETONEMIA) IN DAIRY CATTLE AND SHEEP

(1) CAUSE AND CHARACTERISTICS OF KETOSIS
(2) SYMPTOMS OF KETOSIS
(3) PROCEDURES TO PREVENT KETOSIS

(A) FEEDING
(B) OTHER

(4) TREATMENT PROCEDURES TO USE IF NEEDED

D. IDENTIFYING COLIC IN HORSES

(1) CAUSE AND CHARACTERISTICS OF COLIC
(2) SYMPTOMS OF COLIC
(3) PROCEDURES TO PREVENT COLIC

    (A) FEEDING
    (B) OTHER

  (4) TREATMENT PROCEDURES TO USE IF NEEDED

4. IDENTIFYING HEALTH DISORDERS RELATED TO THE MINERALS FOUND TO BE OVER-ABUNDANT OR DEFICIENT IN THE LOCAL GEOGRAPHICAL AREA

   A. CAUSE AND CHARACTERISTICS OF EACH MINERAL DEFICIENCY ECONOMICALLY IMPORTANT TO THE AREA

      (1) SYMPTOMS OF MINERAL DEFICIENCIES
      (2) PROCEDURES TO PREVENT EACH DEFICIENCY
      (3) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE

   B. CAUSE AND CHARACTERISTICS OF TOXIC MINERALS IN THE LOCAL AREA

      (1) SYMPTOMS WHEN ANIMALS RECEIVE TOO MUCH OF ONE OR MORE OF THE TOXIC MINERALS
      (2) PROCEDURES TO PREVENT TOXICITY OF EACH MINERAL
      (3) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE

   C. IDENTIFYING THE IMPORTANCE OF THE CALCIUM-TO-PHOSPHORUS RATIO IN THE RATION

      (1) SYMPTOMS OF CALCIUM-TO-PHOSPHORUS IMBALANCE
      (2) PROCEDURES TO PREVENT CALCIUM-TO-PHOSPHORUS IMBALANCE IN RATION
      (3) THE IMPORTANCE OF THE VITAMIN D RELATIONSHIP TO CALCIUM-TO-PHOSPHORUS RATIO
      (4) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE

5. IDENTIFYING HEALTH DISORDERS RELATED TO VITAMINS THAT MAY BE DEFICIENT IN THE LOCAL GEOGRAPHICAL AREA

   A. CAUSE AND CHARACTERISTICS OF DEFICIENCY OF EACH VITAMIN OF CONCERN

      (1) DEFICIENCY SYMPTOMS WHEN ANIMAL DOES NOT RECEIVE ENOUGH OF EACH VITAMIN
      (2) PROCEDURES TO PREVENT EACH VITAMIN DEFICIENCY
      (3) TREATMENT PROCEDURES FOR EACH VITAMIN DEFICIENCY IF NEEDED OR AVAILABLE

6. IDENTIFYING BLOAT IN SHEEP, DAIRY AND BEEF CATTLE

   A. CAUSE AND CHARACTERISTICS OF BLOAT

- (1) SYMPTOMS OF ANIMALS CONTRACTING BLOAT
  - (A) EXTENDED PARA-LUMBAR FOSA
  - (B) HIP BONES LOSE IDENTITY
  - (C) ANUS PROTRUDES
  - (D) ANIMAL THRASHES
  - (E) DEATH
- (2) FEEDING PROCEDURES TO AID IN PREVENTING BLOAT
  - (A) USE OF DRY ROUGHAGES
  - (B) USE OF CHEMICALS ADDED TO RATION

7. IDENTIFYING HEALTH DISORDERS RELATED TO UNDERFEEDING A RATION OF POOR QUALITY
   - A. CAUSE AND CHARACTERISTICS OF UNDERFEEDING A POOR QUALITY RATION
   - B. PREVENTING UNDERFEEDING OF POOR QUALITY RATION
   - C. CORRECTING HEALTH DISORDERS CAUSED BY POOR QUALITY RATION
8. IDENTIFYING MISCELLANEOUS HEALTH DISORDERS RELATED TO NUTRITION
   - A. TORSION IN HORSES (TWISTED GUT)
     - (1) CAUSE OF TORSION IN HORSES
     - (2) SYMPTOMS EXHIBITED BY AFFECTED HORSES
     - (3) PREVENTION PROCEDURES TO USE TO GUARD AGAINST TORSION
     - (4) TREATMENT PROCEDURES TO USE IF NEEDED OR AVAILABLE
   - B. CONTROL, TREATMENT AND PREVENTION OF HEALTH DISORDERS RELATED TO INTERNAL PARASITES
     - (1) TAPE WORM
     - (2) THORNY-HEADED WORMS (SWINE)
     - (3) LIVER FLUKES
     - (4) ROUNDWORMS (NEMATODES)

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. CONDUCT FEEDING TRIALS WITH ANIMALS SUCH AS POULTRY OR MICE. EACH STUDENT SHOULD BE RESPONSIBLE FOR FEEDING ONE OR MORE ANIMAL(S) A CONTROL RATION THAT IS NUTRITIONALLY WELL BALANCED AND A SECOND ANIMAL OR GROUP OF ANIMALS AN EXPERIMENTAL RATION WHICH IS INADEQUATE IN

ONE OR MORE NUTRIENTS. A LIVESTOCK NUTRITIONIST MAY BE ABLE TO HELP LOCATE OR SYNTHESIZE RATIONS DEFICIENT IN SPECIFIC NUTRIENTS. STUDENT SHOULD OBSERVE AND RECORD ANY DIFFERENCES NOTED BETWEEN THE TWO ANIMALS DURING AN EXTENDED FEEDING PERIOD. PICTURES, WEIGHT RECORDS, GENERAL HEALTH CONDITIONS, AMOUNT OF FEED EATEN AND ANIMAL ACTIVITY ARE SOME FORMS OF DATA WHICH CAN BE COLLECTED AND USED FOR STUDENT REPORTS AT THE END OF THE FEEDING PERIOD. A FOLLOW-UP STUDY MIGHT BE DONE TO SEE THE AMOUNT OF RECOVERY WHICH WILL OCCUR WHEN THE DEFICIENCY IS CORRECTED. THIS ACTIVITY MAY BE TOO LONG OR TOO COMPLEX TO CARRY OUT IN THE SCHOOL SITUATION.

AN ALTERNATIVE ACTIVITY FOR THIS AREA COULD CONSIST OF MAKING A DISPLAY OF PHOTOGRAPHS OR SLIDES OF TYPICAL NUTRITIONAL DEFICIENCY SYMPTOMS FOR EACH TYPE OF LIVESTOCK. HAVE STUDENTS PRACTICE DEFINING THE NUTRIENTS WHICH ARE INADEQUATE FOR EACH SYMPTOM. MANY OF THESE SYMPTOMS ONLY SHOW UP UNDER CLINICALLY CONTROLLED CONDITIONS. THE STUDENT SHOULD CONCENTRATE THE STUDY ON THE IDENTIFICATION AND METHODS OF PREVENTING THOSE WHICH WOULD MORE TYPICALLY BE ENCOUNTERED IN PRODUCTION SITUATIONS.

2. HAVE A PRODUCER WHO HAS HAD SHEEP WITH OVER-EATING OF CARBOHYDRATES DESCRIBE OR DEMONSTRATE WITH SHEEP THE SYMPTOMS WHICH CAN BE NOTED. STUDENTS CAN COLLECT PICTURES AND MAKE DRAWINGS AND DESCRIPTIONS OF THE SYMPTOMS. HAVE A STUDENT REPORT ON THE MEANS OF PREVENTING THE PROBLEM.

3. PRODUCE A BULLETIN BOARD DISPLAY OF THE UNITED STATES WHICH DEFINES AREAS WHERE THE LIVESTOCK FEEDS PRODUCED IN THESE AREAS ARE DEFICIENT IN CERTAIN MINERALS. MAKE SPECIAL NOTE OF DEFICIENCIES IN THE LOCAL AREA AND ANIMALS EXHIBITING THESE MINERAL DEFICIENCES AND PLACE ON THE DISPLAY WITH PROPER NAMES FOR THE NUTRITIONAL DISORDERS. FOR SEVERAL DAYS, HAVE INDICATORS ON THE DISPLAY DEFINING THE PICTURE ILLUSTRATING SYMPTOMS FOR A MINERAL DEFICIENCY. THEN REMOVE THE INDICATOR AND REARRANGE THE PICTURES. PARTICIPATE IN ONE OR MORE ACTIVITIES TO MATCH THE NAME, THE PICTURE OF THE SYMPTOM AND THE GEOGRAPHIC REGION WHERE SHORTAGE IS LIKELY TO OCCUR.

4. EACH STUDENT PARTICIPATE IN A LIVESTOCK ENTERPRISE GROUP AND MAKE A STUDY OF THE RESEARCH ON VITAMIN DEFICIENCY FOR THAT LIVESTOCK ENTERPRISE. AT THE END OF THE REVIEW OF RESEARCH, EACH GROUP PREPARES A REPORT TO THE CLASS ON ITEMS SUCH AS THE VITAMINS AND THEIR DEFICIENCY SYMPTOMS, THE EFFECTS OF A DEFICIENCY ON HEALTH, PRODUCTION, REPRODUCTION AND DATA ON ECONOMICS OF A DEFICIENCY AND

PREVENTION OR CURE. HAVE THE GROUPS SUMMARIZE THEIR FINDINGS AND DISCUSS WHAT VITAMIN DEFICIENCY SYMPTOMS ARE COMMON TO OTHER LIVESTOCK ENTERPRISES AND WHICH ARE UNIQUE TO THE ENTERPRISE AREA THEY RESEARCHED.

5. A CLASS VISIT TO A LIVESTOCK OR SHEEP FEEDING OPERATION MAY DETECT CASES OF BLOAT. THE STUDENTS CAN STUDY WHERE AND WHAT TO LOOK FOR AND GUIDELINES TO THE SERIOUSNESS OF VARIOUS DEGREES OF BLOAT. THE STUDENTS SHOULD ALSO OBSERVE A DEMONSTRATION ON THE THROAT TUBE AND MOUTH ROPE TO DECREASE NONFROTHY BLOAT. THE CORRECT PLACEMENT OF THE TUBE SHOULD BE STRESSED AND ONLY DONE UNDER CLOSE SUPERVISION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. IF EXAMPLES FROM LIVE ANIMALS ARE NOT AVAILABLE, ASK THE STUDENT TO DESCRIBE A PARTICULAR NUTRITIONAL DISORDER THAT IS IMPORTANT IN YOUR GEOGRAPHICAL AREA. THE STUDENT SHOULD LIST CAUSE, CHARACTERISTICS, SYMPTOMS, PREVENTION TECHNIQUES AND RECOMMEND TREATMENT, IF AVAILABLE, FOR THE DISORDER.

2. THE TEACHER MAY EVALUATE THE REPORT MADE BY EACH STUDENT OR GROUP OF STUDENTS ON THE FEEDING TRIAL. MAJOR POINTS TO NOTE COULD BE DESCRIPTION OF SYMPTOMS OF MICE FED NUTRIENT DEFICIENT RATION, CONDITION OF CONTROL MICE AT END OF TRIAL AND FINALLY THE LENGTH OF TIME REQUIRED TO FEED DEFICIENT MICE BALANCED RATION IN ORDER TO REGAIN HEALTHY APPEARANCE.

3. THE TEACHER MAY EVALUATE THE STUDENT AND REPORT ABOUT THE SAME TRIAL. THE SAME POINTS AS DESCRIBED ABOVE MAY BE EVALUATED ALONG WITH SOME POINTS RELATED TO GIVING REPORTS SUCH AS SPEAKING PLAINLY AND CLEARLY SO THAT EVERYONE MAY HEAR, PROPER POSTURE, USE OF CHARTS OR OTHER AIDS TO GET POINTS ACROSS AND ANSWERING QUESTIONS ASKED BY CLASS. IT IS NECESSARY TO LET THE STUDENT KNOW ABOUT YOUR ORAL REPORT EVALUATION WELL IN ADVANCE SO AS TO GIVE THE STUDENT TIME TO MAKE UP HIS REPORT WITH EVALUATION CRITERIA IN MIND.

4. STUDENT ASSIGNMENT PERTAINING TO WATER NEEDS OF LIVESTOCK FOUND ON HIS FARM MAY BE EVALUATED. EMPHASIS SHOULD BE PLACED ON THE FACT THAT ALL LIVESTOCK REQUIRE PLENTY OF CLEAN, FRESH WATER DAILY IN ORDER TO GROW AND FUNCTION PROPERLY.

5. A. IF A LIVESTOCK NUTRITIONIST OR VETERINARIAN IS USED TO DISCUSS THE NUTRITION DISORDERS COMMON TO YOUR AREA, ASK THE CLASS FOR A BRIEF RESUME OF THE REPORT MADE TO

THE CLASS. INSTRUCT THE STUDENTS TO APPLY WHAT WAS DISCUSSED IN IMPROVING THEIR MANAGEMENT ON THE HOME FARM TO INSURE THAT THEY WOULD NOT INCUR ANY OF THESE DISORDERS.

B. EMPHASIS SHOULD BE PLACED ON RECOGNIZING DEFICIENCY SYMPTOMS OF THE VARIOUS NUTRIENTS IN LIVE ANIMALS. MOST OF THE TIME, THIS IS IMPOSSIBLE, HOWEVER. SIMILATION EXPERIENCES WOULD THEN BE THE NEXT BEST THING. THIS CAN BE DONE BY USE OF SLIDES, PICTURES OR MOVIES.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SUPPLY OF MICE, PREFERABLY TWO FOR EACH STUDENT, WITH SUITABLE LOCATION, CAGES, BEDDING, WATER BOTTLES AND FEED CONTAINERS FOR EACH. STUDENTS COULD DO THIS PROJECT IN GROUPS OR FROM TWO TO FOUR, IF OTHERWISE IMPOSSIBLE TO RUN FEED TRIAL.
2. SUPPLY OF CONTROL FEED FOR MICE AND A SUPPLY OF FEEDS WITH EACH DEFICIENT IN A PARTICULAR VITAMIN OR MINERAL
3. OVERHEAD PROJECTOR WITH TRANSPARENCIES RELATED TO THE TOPIC. PICTURES OR SLIDES OF ANIMALS SHOWING SYMPTOMS OF VARIOUS NUTRITIONAL DEFICIENCIES
4. PROVIDE THE STUDENTS WITH FORMS TO HELP THEM KEEP TRACK OF THEIR FEEDING, WATERING AND OBSERVATIONS OF THEIR MICE ON FEEDING TRIAL
5. REFERENCES WITH INFORMATION ON NUTRITIONAL DISORDERS AND THEIR SYMPTOMS, PREVENTION, TREATMENT AND ECONOMIC SIGNIFICANCE

F. EXAMPLES OF SUPPORTING REFERENCES

1. CRAMPTON, F. W. AND HARRIS, L. F. APPLIED ANIMAL NUTRITION. 2ND EDITION. SAN FRANCISCO, CALIFORNIA: W. H. FREEMAN AND COMPANY. 1969, 753 PAGES.

   THIS BOOK MAY BE USED AS A TEACHER REFERENCE BOOK, ESPECIALLY ON THE TOPIC OF THE FOOD NUTRIENTS AND THEIR IMPORTANCE TO THE BODY. NO PICTURES OR ILLUSTRATIONS ARE PROVIDED IN RELATION TO DEFICIENCIES.

2. ENSMINGER, M. E. ANIMAL SCIENCE. 6TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

THIS REFERENCE IS A STUDENT TEXT BOOK WITH A DISCUSSION ON NUTRITIONAL DISEASES AND AILMENTS ALONG WITH CHART FORM PRESENTATION OF THE IMPORTANT DISORDERS.

3. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. 2ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, 667 PAGES.

   THIS REFERENCE PROVIDES A DISCUSSION OF THE VITAMINS AND MINERALS AND THEIR DEFICIENCY SYMPTOMS WHEN LIMITED IN RATION. ALL THIS IS IN CHART FORM. ANOTHER SECTION OF THE BOOK COVERS ANIMAL HEALTH AND INFORMATION IN CHART FORM ON BLOAT, ENTEROTOXEMIA AND OTHER DISORDERS RELATED TO NUTRITION. THIS TEST IS WRITTEN AT THE HIGH SCHOOL STUDENT'S LEVEL.

4. MORRISONS, FRANK B. FEEDS AND FEEDING. 22ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1956, 1165 PAGES.

   THIS BOOK PROVIDES DISCUSSIONS ON FOOD NUTRIENT DEFICIENCY SYMPTOMS IN LIVESTOCK. CHAPTER V DEALS WITH PROTEINS, FATS AND CARBOHYDRATES; CHAPTER VI WITH MINERALS; AND CHAPTER VII WITH VITAMINS.

STORAGE AND HANDLING OF LIVESTOCK FEEDS

UNIT CONCEPT: EVERY LIVESTOCK FEEDER MUST KNOW THE PROPER MANAGEMENT PROCEDURES ASSOCIATED WITH STORING AND HANDLING FEEDS. TO OVERLOOK BOTH OR EITHER ONE OF THESE CONSIDERATIONS WILL RESULT IN LESS EFFICIENT PRODUCTION, THAT IS, LOSS OF FEED DUE TO FAULTY HANDLING OR STORAGE PROCEDURES ON THE PART OF THE FEEDER, WITH THE END RESULT OF AN ACTUAL LOSS OR SMALLER PROFIT PER ANIMAL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE HOME FARM SITUATION, DEMONSTRATE THE MOST ECONOMIC PROCEDURES TO USE IN STORING AND HANDLING OR HAY OR OTHER SIMILAR ROUGHAGE ON HIS FARM TO INSURE MINIMUM NUTRIENT LOSSES DUE TO SPOILAGE AND WASTE.
2. WHEN GIVEN THE HOME FARM SITUATION, DEMONSTRATE THE MOST ECONOMIC PROCEDURES TO USE IN STORING AND HANDLING OF SILAGE ON HIS FARM TO INSURE MINIMUM NUTRIENT LOSSES DUE TO SPOILAGE AND WASTE.
3. WHEN GIVEN THE HOME FARM SITUATION, DEMONSTRATE THE MOST ECONOMIC PROCEDURES TO USE IN STORING AND HANDLING OF HOME-GROWN GRAINS ON HIS FARM TO INSURE MINIMUM NUTRIENT LOSSES OF SPOILAGE AND WASTE DUE TO RODENTS, DISEASE AND OTHER PARASITES.
4. DEMONSTRATE THE MOST ECONOMIC PROCEDURES TO USE IN STORING AND HANDLING OF COMMERCIAL FEEDS, SUPPLEMENTS AND FEED ADDITIVES USED ON THE HOME FARM IN ORDER TO INSURE MINIMUM PRODUCT LOSSES DUE TO SPOILAGE AND WASTE CAUSED BY RODENTS, DISEASES, PARASITES AND IMPROPER USE AND STORAGE TECHNIQUES FOR FEED ADDITIVES.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE DIFFERENT METHODS OF HANDLING AND STORING HAY OR OTHER SIMILAR ROUGHAGE
    A. BALED HAY
        (1) MOVING BALES
            (A) ELEVATORS

(B) MAN LABOR

(2) MOISTURE CONTENT FOR PROPER STORAGE

(A) WITHOUT AUXILLARY DRYING
(B) WITH AUXILLARY DRYING

(3) AUXILLARY DRYING PROCEDURES

(A) ADVANTAGES OF HAVING AUXILLARY HAY DRYING EQUIPMENT
(B) DRYING BALES ON WAGONS
(C) DRYING BALES IN THE MOW - PROPER STACKING ON THE DRYER
(D) COSTS OF OPERATION

1. INITIAL COST OF UNIT
2. MAINTENANCE COSTS

(4) METHODS OF STORING BALED HAY

(A) ADVANTAGES AND DISADVANTAGES OF STACKING OUTSIDE
(B) ADVANTAGES AND DISADVANTAGES OF STACKING IN THE MOW OR OTHER BUILDING
(C) ADVANTAGES AND DISADVANTAGES OF PILING AS THEY FALL IN AUTOMATED SYSTEM

(5) AUTOMATED HANDLING OF BALED HAY

(A) USE OF SMALL BALE
(B) BALE THROWER ON BALER
(C) SPECIAL HIGH-SIDED WAGON
(D) CONVEYOR SYSTEM AT STORAGE AREA TO DISTRIBUTE

* Place B.1.a above each of the following items and discuss the categories following B.1.a.1 through B.1.a.5 where appropriate.

1. loose hay
2. chopped hay
3. wafered hay or cubes
4. large round bales

2. DETERMINING THE METHOD OF STORAGE AND HANDLING OF HAY OR SIMILAR ROUGHAGE THAT IS MOST EFFICIENT AND ECONOMICAL ON THE STUDENT'S HOME FARM

A. IDENTIFYING THE POTENTIAL LOSS IN QUALITY DUE TO VARIOUS HANDLING AND STORAGE METHODS OF HAY

      (1) NUTRIENTS
      (2) RODENTS
      (3) SPOILAGE AND DISEASES

   B. IDENTIFYING THE EQUIPMENT AND STRUCTURES NEEDED FOR EACH METHOD OF HANDLING AND STORAGE

   C. ANALYZING THE PRESENT SYSTEM OF HANDLING AND STORAGE OF HAY OR SIMILAR ROUGHAGE ON THE STUDENT'S HOME FARM

   D. DETERMINING THE BEST METHOD OF HANDLING AND STORAGE BASED ON EVALUATION OF B.2.A, B.2.B AND B.2.C ABOVE

3. IDENTIFYING THE VARIOUS METHODS OF SILAGE HANDLING AND STORAGE

   A. IDENTIFYING CHARACTERISTICS OF UPRIGHT SILOS

      (1) MATERIALS OF CONSTRUCTION
      (2) COSTS OF CONSTRUCTION AND MAINTENANCE
      (3) EQUIPMENT NEEDED TO FILL AND UNLOAD
      (4) DANGER OF TOXIC GAS PRODUCTION
      (5) ADAPTATION TO SELF OR AUTOMATIC FEEDING SYSTEM
      (6) OTHER ADVANTAGES AND DISADVANTAGES

   B. IDENTIFYING CHARACTERISTICS OF HORIZONTAL SILOS

      (1) TRENCH SILO

         (A) MATERIALS OR CONSTRUCTION
         (B) EQUIPMENT NEEDED TO FILL AND UNLOAD
         (C) ADAPTATION TO SELF OR AUTOMATIC FEEDING SYSTEM
         (D) OTHER ADVANTAGES AND DISADVANTAGES

      (2) BUNKER SILO

         (A) MATERIALS OR CONSTRUCTION
         (B) EQUIPMENT NEEDED TO FILL AND UNLOAD
         (C) ADAPTATION TO SELF OR AUTOMATIC FEEDING SYSTEM
         (D) OTHER ADVANTAGES AND DISADVANTAGES

4. CHEMICAL AND BIOLOGICAL PROCESSES THAT DETERMINE THE QUALITY OF SILAGE

   A. PLANT CELLS

   B. MICROORGANISMS

C. ORGANIC ACID PRODUCTION

D. TEMPERATURE RELATIONSHIP

E. MOISTURE RELATIONSHIP

F. PH RELATIONSHIP

G. HOW THE ABOVE FACTORS INTERACT IN THE SILO TO MAKE HIGH QUALITY SILAGE

5. FILLING THE UPRIGHT SILO TO OBTAIN QUALITY SILAGE

A. DETERMINING WHEN CROP IS AT OPTIMUM MATURITY FOR ENSILING

B. DETERMINING MOISTURE CONTENT OF A CROP FOR ENSILING

C. SETTING THE CHOPPING LENGTH OF THE FORAGE

D. FILLING THE UPRIGHT SILO RAPIDLY

E. EXCLUDING AIR FROM THE GREEN CHOP

(1) PACKING THE UPRIGHT SILO TO EXCLUDE AIR
(2) COVERING THE UPIRGHT SILO TO EXCLUDE AIR

Place the "horizontal" silo in B.5.d. and B.5.e. above and provide the appropriate information as indicated.

F. DETERMINING WHEN SILAGE PRESERVATIVES OR ADDITIVES SHOULD BE ADDED TO FORAGE

(1) CHEMICAL PRESERVATIVES AND THEIR FUNCTION
(2) FEED AND NON-FEED ADDITIVES AND THEIR FUNCTION

6. DETERMINING THE METHOD OF SILAGE HANDLING AND STORAGE THAT IS MOST EFFICIENT AND ECONOMICAL ON THE STUDENT'S HOME FARM

A. POTENTIAL LOSS IN QUALITY DUE TO VARIOUS STORAGE METHODS

        (1) NUTRIENTS LEACHING
        (2) RODENTS
        (3) SPOILAGE AND DISEASE

    B. EQUIPMENT AND STRUCTURE NEEDED FOR EACH METHOD OF HANDLING AND STORAGE OF SILAGE

    C. ANALYZING THE PRESENT SYSTEM OF SILAGE HANDLING AND STORAGE ON THE STUDENT'S HOME FARM

    D. DETERMINING THE BEST METHOD OF SILAGE HANDLING AND STORAGE BASED ON B.6.A, B.6.B, AND B.6.C ABOVE

7. HANDLING AND STORING GRAIN

    A. EVALUATING BULK STORAGE ON THE FARM

        (1) COST ANALYSIS OF FIXED AND VARIABLE GRAIN STORAGE COSTS
        (2) PROBABLE LOSSES

            (A) RODENT AND INSECTS
            (B) SPOILAGE
            (C) SHRINKAGE

        (3) TYPE OF STORAGE STRUCTURE NEEDED FOR BEST RESULTS
        (4) TYPE OF HANDLING EQUIPMENT NEEDED

            (A) HAND METHODS
            (B) MECHANICAL METHODS

        (5) OTHER ADVANTAGES AND DISADVANTAGES

    B. EVALUATING THE USE OF COOPERATIVE GRAIN STORAGE AT THE LOCAL GRAIN ELEVATOR

    C. CONDITIONS NECESSITATING PILING OF GRAIN ON GROUND

    D. CONDITIONS NECESSITATING USING OTHER METHODS OF STORAGE

    E. USE CRITERIA USED IN B.7.A ABOVE TO EVALUATE B.7.B, B.7.C, AND B.7.D

8. IDENTIFYING THE NEED FOR AERATING AND POSSIBLY DRYING STORED GRAINS

    A. CRITICAL MOISTURE CONTENT LEVELS FOR STORING GRAIN

    B. EQUIPMENT NEEDED TO AERATE GRAINS

- C. DETERMINING AIR FLOW DIRECTIONS
- D. COSTS OF AERATION
- E. DETERMINING WHEN GRAINS NEED TO BE DRIED BEFORE STORAGE
- F. METHODS OF DRYING GRAIN
- G. EQUIPMENT NEEDED FOR DRYING GRAIN
- H. COSTS OF GRAIN DRYING
- I. DETERMINING WHETHER TO PURCHASE DRYING EQUIPMENT OR TO PAY TO HAVE IT DONE AT THE GRAIN ELEVATOR

9. DETERMINING THE METHOD OF GRAIN STORAGE AND HANDLING TO USE FOR MOST EFFICIENT AND ECONOMICAL RETURNS

10. IDENTIFYING METHODS OF STORING AND HANDLING OF COMMERCIAL FEEDS, SUPPLEMENTS AND FEED ADDITIVES USED ON THE HOME FARM

    - A. EVALUATING HANDLING AND STORAGE OF COMMERICAL GRAINS AND SUPPLEMENTS IN BAGS
        - (1) LABOR INVOLVED (COSTS)
        - (2) RODENT AND SPOILAGE PROBLEMS
        - (3) CHARACTERISTICS OF STORAGE AREA NEEDED
        - (4) OTHER ADVANTAGES AND DISADVANTAGES
    - B. EVALUATING HANDLING AND STORAGE OF COMMERICAL GRAINS AND SUPPLEMENTS IN BULK BINS
        - (1) LABOR INVOLVED (COSTS)
        - (2) RODENT AND SPOILAGE PROBLEMS
        - (3) CHARACTERISTICS OF STORAGE AREA NEEDED
        - (4) OTHER ADVANTAGES AND DISADVANTAGES
    - C. IDENTIFYING THE USE OF COOPERATIVE GRAIN ELEVATOR
        - (1) KNOW HOME STORAGE PROBLEMS
        - (2) COSTS INVOLVED
        - (3) ADVANTAGES AND DISADVANTAGES OF THIS PROCEDURE
    - D. EVALUATING THE USE OF LIQUID SUPPLEMENTS ON THE FARM
        - (1) RUMINANT USE
        - (2) NON-RUMINANT USE
        - (3) COSTS INVOLVED
        - (4) ADVANTAGES AND DISADVANTAGES

E. METHODS OF STORING FEED ADDITIVES ON THE FARM

  (1) PROPER PRESERVATION PROCEDURES

    (A) REFRIGERATION
    (B) DRY STORAGE
    (C) OTHER PROCEDURES

  (2) RECOGNIZING SHELF LIFE OF ADDITIVE
  (3) RECOGNIZING ANY LEGAL IMPLICATIONS RELATED TO STORAGE PROCEDURES

    (A) LIABILITY IF CHILDREN CAN EASILY HAVE ACCESS
    (B) TOXIC EFFECTS IF STORAGE IS TOO LONG

11. DETERMINING THE METHOD OF STORING AND HANDLING COMMERCIAL FEEDS AND SUPPLEMENTS MOST PRACTICALLY AND ECONOMICALLY ON EACH STUDENT'S HOME FARM

  A. IDENTIFYING TYPE OF LIVESTOCK RAISED

  B. IDENTIFYING THE VOLUME OF BUSINESS

  C. IDENTIFYING FUTURE PLANS FOR EXPANSION OR REDUCTION IN SIZE

  D. IDENTIFYING PRESENT FACILITIES

  E. DETERMINING A STORAGE AND HANDLING SYSTEM THAT BEST FITS THE SITUATION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. TAKE A FIELD TRIP TO ONE OF THE STUDENT'S FARMS THAT HAS A BARN MOW HAY DRIER. PRE-ARRANGE WITH A GROUP OF STUDENTS TO HAVE THEM SHOW THE CLASS HOW TO PROPERLY STACK HAY ON THE DRIER.

2. ASSIGN ANOTHER GROUP OF STUDENTS THE TASK OF DEMONSTRATING TO THE REST OF THE CLASS MEMBERS HOW TO PROPERLY COVER A SILO, UPRIGHT OR HORIZONTAL, AFTER IT IS FULL. THE STUDENTS MAY HAVE THE OPTION OF USING AN ACTUAL DEMONSTRATION AT A FARM OR THEY MAY USE VISUAL AIDS IN THE CLASSROOM.

3. STILL ANOTHER GROUP OF STUDENTS COULD BE ASKED TO DO A DEMONSTRATION SIMILAR TO #2 ABOVE ON THE PROPER STORAGE OF HOME-GROWN FEEDS TO INSURE MINIMAL LOSSES DUE TO RODENTS, DISEASE AND PARASITES.

4. HAVE THE LOCAL FEED STORE MANAGER TALK TO THE CLASS ABOUT THE PROPER HANDLING AND STORING OF COMMERCIAL FEEDS ON THE HOME FARM. HOLD EACH STUDENT RESPONSIBLE FOR A REPORT ON THIS DISCUSSION. THIS MAY BE ACCOMPLISHED BY A FIELD TRIP, IF THE MANAGER CANNOT MAKE IT TO THE CLASS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PAPER AND PENCIL TEST - DEFINE WHICH METHOD OF HANDLING HAY BALING OR WAFERING WOULD BE MOST PRACTICAL TO USE ON A GIVEN FARM.

2. OUTLINE THE MAJOR STEPS TO FOLLOW IN MAKING QUALITY SILAGE OR HAYLAGE. EMPHASIS SHOULD BE PLACED ON THE AREAS OF CORRECT MOISTURE CONTENT OF FORAGE USED, FINENESS OF CROP, PROPER PACKING OF SILO, RAPIDITY OF FILLING SILO AND SEALING THE SILO.

3. OUTLINE A PROGRAM WHICH WOULD HELP CONTROL RODENTS FROM CONSUMING LARGE AMOUNTS OF THE HOME GROWN GRAINS. EMPHASIS SHOULD BE PLACED ON METHODS THAT WILL NOT AFFECT THE LIVESTOCK THAT CONSUME THE GRAIN. A CHECK SHOULD BE MADE TO INSURE THAT THE CHEMICALS USED ARE CLEARED BY THE FOOD AND DRUG ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY.

4. VISIT THE STUDENTS AT THE TIME OF YEAR WHEN THEY ARE HANDLING AND STORING FEEDS AND OBSERVE HOW WELL THE STUDENTS PERFORM. HAVE THEM DEMONSTRATE A PARTICULAR APPROVED PRACTICE SUCH AS HOW TO STORE COMMERICAL FEEDS TO PROTECT FROM RODENTS THAT THEY HAVE LEARNED IN THE CLASSROOM. ASK THEM TO EXPLAIN THE BASIC PRINCIPLES THAT MAKE THE PARTICULAR PRACTICE SOUND. THIS IS THE IDEAL TYPE OF EVALUATION AND ANY OTHER METHOD SHOULD BE USED ONLY WHEN TIME OR PRACTICALITY DOES NOT PERMIT USE OF STUDENT DEMONSTRATION ON THE HOME FARM.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. 35 MM. CAMERA TO USE TO TAKE SLIDE PICTURES OF SUCCESSFUL FARMERS' METHODS OF HANDLING AND STORAGE OF FEEDS ON THEIR FARMS.

2. SLIDE PROJECTOR AND SCREEN FOR SHOWING SLIDES

3. PICTURES AND/OR SLIDES ALONG WITH INFORMATION TO SHOW THE AMOUNT OF FEED THAT IS LOST DUE TO SPOILAGE, DISEASE AND WASTE DIRECTLY RELATED TO IMPROPER STORAGE AND HANDLING OF FEEDS.

4. PROVIDE EACH STUDENT WITH A CLIP BOARD AND FIELD TRIP REPORT FORM WHEN GOING ON A FIELD TRIP. THE STUDENT SHOULD BE ASKED TO ANSWER CERTAIN QUESTIONS PERTAINING TO THE PRACTICES USED BY THE FARM OR FARMS VISITED.

F. EXAMPLES OF SUPPORTING REFERENCES

1. FOLEY, RICHARD C., BATH, DONALD L., DICKINSON, FRANK W. AND TUCKER, H. ALLEN. *DAIRY CATTLE: PRINCIPLES, PRACTICES, PROBLEMS, PROFITS*. PHILADELPHIA, PENNSYLVANIA: LEA AND FEDIGER. 1972, PP. 223-246.

   THIS CHAPTER ENTITLED, "FEEDS FOR DAIRY CATTLE," PROVIDES A TEACHER REFERENCE FOR INFORMATION ON SILAGE MAKING, TYPES OF SILOS, KINDS OF SILAGES, HAYLAGE, HAY MAKING, FORAGES USED FOR HAY, PHYSICAL FORM AND TREATMENT OF ROUGHAGES. EXAMPLES CITED ARE BALING, PELLETING AND WAFERING. FINALLY, FORAGE EVALUATION IS DISCUSSED ALONG WITH CONCENTRATES INCLUDING LIQUID SUPPLEMENTS.

2. *GRASSLAND MANUAL*. NEW HOLLAND, PENNSYLVANIA: NEW HOLLAND MACHINE COMPANY. 1962, 186 PAGES.

   THIS BOOK DEALS WITH CHAPTERS ON GROWING, HARVESTING, SYSTEMS OF HANDLING GRASS CROPS, STORING AND FEEDING OF GRASSLAND CROPS. IT IS WRITTEN SO THAT HIGH SCHOOL STUDENTS COULD USE THIS AS A REFERENCE.

3. *HAYLAGE - NEW WAY TO HARVEST GRASS FORAGE*. CHICAGO, ILLINOIS: INTERNATIONAL HARVESTER COMPANY. 15 PAGES.

   THIS REFERENCE ON MAKING HAYLAGE IS ILLUSTRATED WITH GRAPHS AS WELL AS PICTURES. IT IS WRITTEN AT THE LEVEL THAT HIGH SCHOOL STUDENTS COULD USE AS A REFERENCE.

4. LOCAL STATE COOPERATIVE EXTENSION SERVICE BULLETINS.

   MANY OF THE TOPICS DEALT WITH IN THIS UNIT HAVE BULLETINS WRITTEN BY THE EXTENSION SERVICE WHICH THE TEACHER CAN USE FOR REFERENCE. IT IS SUGGESTED THAT THE TEACHER ACQUIRE THE LATEST LIST OF PUBLICATIONS FROM HIS STATE'S AND SURROUNDING STATES' EXTENSION SERVICES IN ORDER TO USE THIS VALUABLE RESOURCE FOR OBTAINING GOOD ECONOMICAL REFERENCE MATERIAL.

5. U.S.D.A. FARMER BULLETINS. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. (A) *HANDLING AND STORING SOFT CORN ON THE FARM*. BULLETIN 1976. 1954, 11 PAGES; (B) *DRYING SHELLED CORN AND SMALL GRAINS*. BULLETIN 2214. 1965, 11 PAGES; AND (C) *STORED GRAIN PESTS*. BULLETIN 1260. 1965, 46 PAGES.

SANITATION AND ANIMAL HEALTH

UNIT CONCEPT: IN ORDER TO REDUCE THE POSSIBILITY OF LIVESTOCK DISEASE, THE LIVESTOCK PRODUCER MUST FIT OR MATCH MANAGEMENT PRACTICES TO THE ENVIRONMENT OF THE ANIMAL. IF SANITARY PRACTICES ARE OBSERVED AND FOLLOWED, THE POSSIBILITY OF LIVESTOCK ILL-HEALTH CAN BE REDUCED OR ELIMINATED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN AN AREA WHERE LIVESTOCK ARE TO BE HOUSED, THE SPECIES OF LIVESTOCK, AND REFERENCES WHICH GIVE REQUIREMENTS FOR SPECIFIC LIVESTOCK, DETERMINE THE MOST APPROPRIATE FACILITIES AND EQUIPMENT NEEDED TO REDUCE THE POSSIBILITY OF DISEASE INFECTION.
2. WHEN GIVEN SPECIFIC OPERATIONS SUCH AS CASTRATING OR DOCKING, SELECT DISENFECTANTS AND DEMONSTRATE THE SANITARY PRECAUTIONS OR CONSIDERATIONS THAT MUST BE FOLLOWED IN USING THE CHOSEN DISENFECTANT IN ORDER TO PREVENT OR REDUCE THE POSSIBILITY OF DISEASE INFECTION.
3. WHEN GIVEN A GROUP OF LIVESTOCK ANIMALS, THEIR INTENDED USE, AND REFERENCES, DESCRIBE THE SANITARY PRACTICES, PROCEDURES, OR SURROUNDINGS WHICH MUST BE FOLLOWED OR PROVIDED IN ORDER TO REDUCE OR ELIMINATE THE POSSIBILITY OF DISEASE INFECTION.

B. INSTRUCTIONAL AREAS

1. PROVIDING LIVESTOCK WITH SANITARY SURROUNDINGS
    - A. DETERMINING PHYSICAL SURROUNDING NEEDS OF LIVESTOCK SPECIES SUCH AS FRESH AIR, SHELTER, AND SUFFICIENT SPACE FOR ACTIVITY
    - B. DETERMINING METHODS OF PROVIDING ADEQUATE VENTILATION
    - C. DETERMINING METHODS OF PROVIDING ADEQUATE AIR MOISTURE FOR LIVESTOCK
    - D. DETERMINING EFFECTS OF CONFINEMENT HOUSING ON THE POSSIBILITY OF DISEASE.

   - E. DETERMINING METHODS OF PREVENTING RODENTS AND BIRDS FROM CONTAMINATING FEED OR DRINKING WATER
   - F. PROTECTING DRINKING WATER FROM CONTAMINATION BY LIVESTOCK
   - G. DETERMINING REQUIREMENTS OF SANITARY HOUSING SUCH AS DRAINAGE, SPACE, AND EASE OF CLEANING
   - H. DISPOSING OF MANURE TO REDUCE THE POSSIBILITY OF DISEASE.
      - (1) DETERMINING DETRIMENTAL EFFECTS OF ACCUMULATED MANURE
      - (2) METHODS OF REMOVING MANURE FROM LIVESTOCK AREAS
   - I. IDENTIFYING PURPOSE AND TECHNIQUES OF PASTURE ROTATION IN DISEASE PREVENTION
   - J. DETERMINING EFFECT OF UNCLEAN FEED CONTAINERS AND LIVESTOCK PENS ON DISEASE INFECTION

2. DISPOSING OF LIVESTOCK CARCASSES
   - A. RECOGNIZING THE RELATIONSHIP OF CARCASSES TO DISEASE INFECTION
   - B. DETERMINING METHOD OF DISPOSAL MOST APPROPRIATE FOR THE SITUATION
      - (1) BURNING
      - (2) BURIAL
      - (3) RENDERING
   - C. ACQUIRING PROFESSIONAL ASSISTANCE FOR DETERMINING CAUSE OF DEATH THROUGH POST-MORTEM EXAMINATION

3. USING DISENFECTANTS IN THE SANITATION PROGRAM
   - A. DETERMINING METHODS OF DISENFECTING AND SANITIZING LIVESTOCK EQUIPMENT AND FACILITIES
   - B. EVALUATING THE PHYSICAL METHODS OF CLEANING AND DISENFECTING USED IN THE SANITATION PROGRAM
   - C. USING PHYSICAL METHODS FOR DISENFECTING
   - D. USING CHEMICAL DISENFECTANTS IN SANITATION
      - (1) DETERMINING CHARACTERISTICS OF IDEAL DISENFECTANTS

(2) SELECTING DISENFECTANTS FOR USE
(3) DETERMINING PROPER PROCEDURES AND TECHNIQUES FOR EFFECTIVE DISENFECTANT USE

(A) CLEANING PROCEDURES BEFORE USE
(B) DILUTING DISENFECTANTS ACCORDING TO RECOMMENDATIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS STUDY PICTURES, SLIDES OR OTHER VISUAL AIDS WHICH SHOW UNSANITARY LIVESTOCK EQUIPMENT AND FACILITIES AND THEN DETERMINE WHAT PRACTICES COULD BE IMPLEMENTED TO CORRECT THE GIVEN SITUATIONS.

2. A. USING LABELS FROM VARIOUS CHEMICAL DISENFECTANTS, HAVE STUDENTS DETERMINE THE PHENOL COEFFICIENT AND INTERPRET ITS MEANING, THE DILUTION AT WHICH THE DISENFECTANT IS BEST USED, THE BEST TEMPERATURE FOR USE, AND HOW THOROUGH THE APPLICATION MUST BE FOR EFFECTIVENESS.

   B. HAVE STUDENTS MAKE AN ANALYSIS TO COMPARE THE ADVANTAGES, DISADVANTAGES OF EACH DISENFECTANT STUDIED AND ALSO DETERMINE WHICH LIVESTOCK SPECIES SHOULD NOT BE EXPOSED TO CERTAIN OF THESE (SUCH AS DAIRY AND CRESOLS).

3. HAVE STUDENTS OUTLINE A PROGRAM OF SANITATION PRACTICES THAT SHOULD BE FOLLOWED IN DAY TO DAY ACTIVITIES FOR SPECIFIC LIVESTOCK SPECIES. THESE MIGHT INCLUDE CLEANING AND DISENFECTING PRACTICES DURING MILKING, MANURE DISPOSAL IN BEEF OPERATIONS, AND OTHER SIMILAR SITUATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. STUDENTS SHOULD LIST THE FACTORS TO CONSIDER IN SELECTING FACILITIES AND EQUIPMENT THAT WILL PROVIDE SANITARY CONDITIONS FOR LIVESTOCK. THIS LIST SHOULD INCLUDE: (1) PHYSICAL SURROUNDINGS, (2) TYPE OF HOUSING, (3) POTENTIAL PROBLEMS WITH VARIOUS TYPES OF FACILITIES, AND (4) WATERING FACILITIES AVAILABLE.

2. GIVE STUDENTS A LIST OF DISENFECTANTS AND HAVE THEM MATCH THE DISENFECTANT WITH TYPE OF ACTIVITY SUCH AS CASTRATION AND DOCKING, THAT IS MOST APPROPRIATE.

3. HAVE STUDENTS OUTLINE A SANITATION PLAN FOR A SPECIFIC TYPE OF LIVESTOCK OPERATION. THEY SHOULD BE EVALUATED ON THE BASIS OF WHETHER THEY HAVE CONSIDERED THE CRITICAL FACTORS ASSOCIATED WITH DISEASE CONTROL THROUGH SANITATION.

E. EXAMPLES OF INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF COMMONLY USED DISENFECTANTS
2. UP-TO-DATE REFERENCES WHICH DEAL WITH DISENFECTANTS
3. SLIDES AND PICTURES OF UNSANITARY LIVESTOCK SURROUNDINGS FOR ANALYSIS.

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M.E. ANIMAL SCIENCE, 6TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

   THIS PUBLICATION GIVES A GENERAL OVERVIEW OF THIS SUBJECT INCLUDING SANITATION PROCEDURES, DISENFECTANTS TO USE AND THE PROPER APPLICATION FOR EFFECTIVENESS.

2. ENSMINGER, M.E. THE STOCKMAN'S HANDBOOK, 2ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS. 1960, 667 PAGES.

   A GOOD REFERENCE WHICH GIVES AN OUTLINE OF LIVESTOCK OPERATION AND DISEASE CONTROL BY THE PROPER SANITATION METHODS.

3. RECENT PUBLICATIONS SHOULD BE ACQUIRED FOR UP-TO-DATE RECOMMENDATIONS REGARDING DISENFECTANTS COMMONLY USED IN THE LOCAL AREA.

DETECTING AND CONTROLLING COMMON LIVESTOCK DISEASES

UNIT CONCEPT: LIVESTOCK DISEASES ARE A SERIOUS THREAT TO THE LIVESTOCK INDUSTRY AND MUST BE PREVENTED OR CONTROLLED IN ORDER TO MINIMIZE ECONOMIC LOSS TO THE LIVESTOCK FARMER. THE PRODUCER MUST BE ABLE TO DETECT, PREVENT AND CONTROL DISEASES USING RECOMMENDED TECHNIQUES IN ORDER TO REDUCE THESE LOSSES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN VARIOUS LIVESTOCK ANIMALS COMMON TO THE LOCAL AREAS INFESTED WITH COMMON DISEASES, AND A RECOGNIZED REFERENCE WHICH DESCRIBES SYMPTOMS AND TREATMENTS FOR LIVESTOCK DISEASE, DETERMINE THE DISEASE CAUSING DAMAGE, THE RECOMMENDED TREATMENT, AND WHETHER TECHNICAL OR PROFESSIONAL ASSISTANCE IS NEEDED TO CARRY OUT RECOMMENDED CONTROL PROCEDURES.

2. WHEN GIVEN A LIST OF DISEASES OF LIVESTOCK COMMON TO THE LOCAL AREA, OUTLINE A PREVENTATIVE CONTROL PROGRAM USING RECOGNIZED REFERENCES FOR THE GIVEN DISEASES, SUCH THAT THE POSSIBILITY OF DISEASE CAN BE REDUCED OR ELIMINATED IN A GIVEN HERD OR LIVESTOCK.

3. WHEN GIVEN RECOMMENDED TREATMENTS FOR SPECIFIC DISEASE WHICH DO NOT REQUIRE TECHNICAL OR PROFESSIONAL ASSISTANCE, AND ANIMALS NEEDING TREATMENT, CARRY OUT THE TECHNIQUES, PROCEDURES AND/OR PROCESSES NECESSARY TO EFFECTIVELY CONTROL THE DISEASE(S) IN QUESTION.

B. INSTRUCTIONAL AREAS

1. DETECTING DISEASE IN LIVESTOCK AND THE CAUSE OF THE DISEASE

    A. DETERMINING THE HARMFUL EFFECT OF DISEASE ON LIVESTOCK

    B. CLASSIFYING DISEASES THAT AFFECT LIVESTOCK

  - (1) DETERMINING LIVESTOCK SPECIES AFFECTED BY COMMON DISEASES
  - (2) CLASSIFYING ACCORDING TO SOURCE OF DISEASE

- C. DETERMINING GEOGRAPHICAL DISTRIBUTION OF COMMON DISEASES

- D. RECOGNIZING PHYSICAL CHANGES (SYMPTOMS) WHICH INDICATE DISEASE

2. TREATING AND CONTROLLING LIVESTOCK DISEASE

- A. DETERMINING NATURAL DEFENSES AGAINST DISEASE

- B. DETERMINING RECOMMENDED TREATMENT FOR SPECIFIC DISEASE PROBLEMS FROM REFERENCES

  - (1) DRUGS AND MEDICINES
  - (2) PHYSICAL THERAPY
  - (3) MANAGEMENT PRACTICES

- C. DETERMINING IF PROFESSIONAL (VETERINARY) ASSISTANCE IS NEEDED FOR TREATMENT

- D. ADMINISTERING TREATMENT OR MEDICINE ACCORDING TO RECOMMENDED PROCEDURES

  - (1) USING SYRINGES FOR INTRA-MUSCULAR INJECTIONS
  - (2) TECHNIQUES FOR ADMINISTERING TREATMENTS BY MOUTH
  - (3) ISOLATING DISEASED ANIMALS

3. PREVENTING LIVESTOCK DISEASES

- A. DETERMINING DISEASES WHICH ARE POSSIBLE THREATS TO LIVESTOCK WHICH CAN BE PREVENTED THROUGH MANAGEMENT PLANNING.

- B. DETERMINING MOST EFFECTIVE CONTROL PRACTICES TO AVOID DISEASE IN HERD OR FLOCK.

  - (1) USING MEDICATIONS FOR IMMUNITY AGAINST DISEASE
  - (2) SANITATION PRACTICES WHICH WILL HELP IN DISEASE PREVENTION
  - (3) ISOLATING NEW ANIMALS BROUGHT INTO HERD FOR OBSERVATIONS
  - (4) FEEDING PRACTICES WHICH WILL HELP PREVENT DISEASES

C. OUTLINING A DISEASE CONTROL PROGRAM FOR SPECIFIC LIVESTOCK SPECIES

(1) SANITATION PRACTICES
(2) ISOLATION TECHNIQUES
(3) MEDICATIONS TO BE USED
(4) TIME OF YEAR FOR IMPLEMENTING SPECIFIC CONTROL PROCEDURES FOR EFFECTIVENESS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS MAKE A PERSONAL REFERENCE GUIDE FOR DISEASES COMMON TO THE LOCAL AREA WHICH GIVES THE DISEASE, SPECIES AFFECTED, CAUSE, SYMPTOMS, RECOMMENDED TREATMENT, CONTROL AND ERADICATION, AND PREVENTATIVE PRACTICES.

   B. HAVE LOCAL VETERINARIAN SPEAK TO CLASS AND PRESENT TECHNIQUES OF DISEASE TREATMENT AND CONTROL WHICH CAN BE PERFORMED WITHOUT TECHNICAL OR PROFESSIONAL ASSISTANCE.

2. USING SLIDES, PICTURES, OR OTHER VISUAL AIDS, HAVE STUDENTS LOOK AT DISEASED ANIMALS AND THEN OUTLINE PROCEDURES OR PRACTICES WHICH WOULD HAVE PREVENTED THE PARTICULAR SITUATION.

3. HAVE STUDENTS PRACTICE GIVING INTRA-MUSCULAR INJECTIONS TO ANIMALS WHEN CLASS MEMBERS WITH LIVESTOCK PROJECTS ARE GIVING PREVENTATIVE INJECTIONS SUCH AS BLACKLEG TO YOUNG CALVES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING SLIDES, PICTURES OR OTHER VISUAL AIDS SHOWING LIVESTOCK INFESTED WITH LIVESTOCK DISEASES, HAVE STUDENTS MATCH THESE WITH A LIST OF CAUSES OF DISEASES SHOWN WITH COMPLETE ACCURACY.

2. HAVE STUDENTS DEMONSTRATE THE PROPER PROCEDURE FOR GIVING INTRA-MUSCULAR INJECTIONS WITH COMPLETE ACCURACY. IF ANIMALS ARE NOT AVAILABLE, USE A SPONGE FOR "SIMULATION." AFTER INJECTION IS COMPLETED, STUDENT MUST DEMONSTRATE PROPER CLEANING PROCEDURE.

3. WITH A SPECIFIC SITUATION, STUDENT SHOULD LIST THE SANITATION PRACTICES WHICH WILL ASSIST IN PREVENTING DISEASE INFESTATION IN LIVESTOCK.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES OR PICTURES, OR OTHER VISUAL AIDS SHOWING DISEASED LIVESTOCK.
2. SYRINGES AND BALLING GUNS, HOSES FOR DRENCHING
3. SAMPLE MEDICATIONS FOR COMMON DISEASES OF AREA

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M.E. ANIMAL SCIENCE, 6TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS. 1969, 1253 PAGES.

   THIS TEXT DEALS IN A COMPREHENSIVE MANNER WITH ALL ASPECTS OF ANIMAL SCIENCE AND SPECIFIC CHAPTERS DEAL WITH DISEASES COMMON TO THE VARIOUS LIVESTOCK SPECIES.

2. ENSMINGER, M.E. THE STOCKMAN'S HANDBOOK, 2ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS. 1960, 667 PAGES.

   THIS HANDBOOK BY THE SAME AUTHOR AS REFERENCE NO. 1 PRESENTS DISEASE DISCUSSION IN CHART FORM WHICH LISTS SPECIES AFFECTED, CAUSE, PREVENTION, TREATMENT AND CONTROL. ALSO INCLUDES CHARTS AND DISCUSSION FOR INSECTS, PARASITES AND OTHER LIVESTOCK PESTS.

3. PFIZER, CHARLES. ANIMAL HEALTH HANDBOOK. NEW YORK, NEW YORK: PFIZER CHEMICAL COMPANY, 235 E. 42ND STREET, 10017.

   A COMPREHENSIVE REFERENCE WHICH DEALS WITH COMMON LIVESTOCK HEALTH PROBLEMS INCLUDING A GOOD DISCUSSION OF LIVESTOCK DISEASES AND RECOMMENDED PREVENTION AND CONTROL.

DETECTING AND CONTROLLING ANIMAL PARASITES

UNIT CONCEPT: PARASITES OF LIVESTOCK CAN CAUSE SIGNIFICANT ECONOMIC LOSS UNLESS CONTROL AND/OR PREVENTION PRACTICES ARE FOLLOWED. THE LIVESTOCK PRODUCER MUST BE ABLE TO DETECT, PREVENT AND CONTROL PARASITES USING PROVEN MEASURES IN ORDER TO REDUCE THESE LOSSES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN VARIOUS LIVESTOCK ANIMALS COMMON TO THE LOCAL AREA INFESTED WITH COMMON PARASITES AND A RECOGNIZED REFERENCE WHICH DESCRIBES SYMPTOMS AND TREATMENT OF PARASITE INFESTATION, DETERMINE THE PARASITE CAUSING THE DAMAGE, THE SOURCE OF THE PARASITE, THE RECOMMENDED TREATMENT, AND WHETHER TECHNICAL OR PROFESSIONAL ASSISTANCE IS NEEDED TO CARRY OUT RECOMMENDED CONTROL PROCEDURES.

2. WHEN GIVEN A LISTING OF PARASITES COMMON TO THE LOCAL AREA WHICH MAY INFEST LIVESTOCK, OUTLINE A PREVENTATIVE CONTROL PROGRAM USING RECOGNIZED REFERENCES FOR THE GIVEN PARASITES, SUCH THAT PARASITE INFESTATION CAN BE REDUCED OR ELIMINATED IN A GIVEN HERD OF LIVESTOCK.

3. WHEN GIVEN RECOMMENDED PARASITE TREATMENTS WHICH CAN BE PERFORMED WITHOUT TECHNICAL OR PROFESSIONAL ASSISTANCE AND ANIMALS NEEDING TREATMENT, CARRY OUT THE PROCEDURES AND/OR PROCESSES NECESSARY TO EFFECTIVELY CONTROL THE PARASITE(S) IN QUESTION.

B. INSTRUCTIONAL AREAS

1. DETECTING PARASITE INFESTATIONS AND THEIR RELATION TO PRODUCTION EFFICIENCY

    A. DETERMINING THE HARMFUL EFFECTS OF PARASITES TO LIVESTOCK

    B. CLASSIFYING PARASITES TYPES

        (1) PROTOZOA
        (2) HELMINTHS (WORM PARASITES)
        (3) ARTHROPODS

- C. DETERMINING PARASITE ADAPTATIONS
  - (1) DETERMINING WHETHER PARASITES ARE EXTERNAL OR INTERNAL FEEDERS
  - (2) DETERMINING WAYS PARASITES MOVE AND DAMAGE HOST
- D. DETERMINING AND RECOGNIZING SYMPTOMS CAUSED BY PARASITIC INFESTATIONS AND INFECTIONS IN VARIOUS CLASSES OF LIVESTOCK

2. CONTROLLING LIVESTOCK PARASITES
   - A. UNDERSTANDING LIFE CYCLES OF PARASITES AND DETERMINING BEST TIME FOR CONTROL
   - B. USING DIRECT CONTROL METHODS FOR PARASITES THROUGH MEDICATION
     - (1) SELECTING PESTICIDES FOR CONTROL
       - (A) DETERMINING PROPER PROCEDURES FOR APPLICATION AND/OR ADMINISTRATION OF PESTICIDES
       - (B) ADMINISTERING PESTICIDES FOR CONTROL
     - (2) USING ANTHELMINTICS FOR CONTROLLING PARASTIES
   - C. USING INDIRECT CONTROL METHODS
     - (1) DETERMINING SANITATION PRACTICES WHICH WILL AID IN CONTROL
       - (A) ISOLATION
       - (B) DISINFECTANTS
       - (C) CONTROLLING PARASITES CARRYING INSECTS AND RODENTS
     - (2) DETERMINING NUTRITIONAL PRACTICES WHICH AID IN CONTROL OF PARASITES
     - (3) DETERMINING METHODS OF PASTURE ROTATION RELATED TO PARASITE CONTROL
   - D. DETERMINING OF PROFESSIONAL ASSISTANCE (VETERINARY) IS NEEDED TO CONTROL PARASITIC INFESTATION(S)
3. PLANNING A PARASITE CONTROL PROGRAM
   - A. DETERMINING PARASITES WHICH MAY BE CONTROLLED THROUGH PLANNING AND PREVENTATIVE PRACTICES
   - B. DETERMINING MOST EFFECTIVE CONTROL PRACTICES TO AVOID PARASITE INFESTATIONS
   - C. OUTLINING A PREVENTATIVE PROGRAM FOR SPECIFIC LIVESTOCK SPECIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USING SLIDE SERIES, PICTURES OR VISITING A PACKING HOUSE, HAVE STUDENTS DETERMINE DAMAGE TO HIDES BY GRUB DAMAGE AND THEN OUTLINE PROCEDURES OR PRACTICES WHICH WOULD HAVE PREVENTED THIS DAMAGE.

2. HAVE STUDENT GROUPS MAKE CHARTS SHOWING COMMON PARASITES, CLASS OF LIVESTOCK EFFECTED, DAMAGE DONE, SYMPTOMS, TREATMENT, AND CONTROL PROCEDURES FOR PREVENTION.

3. VISIT LOCAL FARMS WHEN THEY ARE DIPPING CATTLE OR SHEEP FOR PARASITES AND HAVE STUDENTS ASSIST IN THE OPERATION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS MATCH A LIST OF PARASITE PROBLEMS WITH THE SOURCE OF THE PROBLEM WITH 95% ACCURACY.

2. HAVE EACH STUDENT OUTLINE A PREVENTATIVE PARASITE CONTROL PROGRAM FOR AT LEAST ONE CLASS OF LIVESTOCK COMMON TO THE AREA USING RECOGNIZED REFERENCES.

3. EACH STUDENT SHOULD DEMONSTRATE THE RECOMMENDED PREVENTION AND CONTROL, OR TREATMENT PROCEDURES FOR A SPECIFIC PARASITE PROBLEM IN A GIVEN CLASS OF LIVESTOCK. THESE PROCEDURES WOULD BE ONLY FOR THOSE PROBLEMS WHICH DO NOT REQUIRE TECHNICAL OR PROFESSIONAL ASSISTANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURE, OR PRESERVED SPECIMENS OF VARIOUS PARASITES AFFECTING LIVESTOCK

2. SAMPLES OF DISENFECTANTS, DIP PREPARATIONS ANTHELMINTICS PESTICIDES USED FOR CONTROLLING PESTICIDES

3. REFERENCES WHICH OUTLINE SYMPTOMS, PREVENTION AND CONTROL MEASURES FOR SPECIFIC PARASITES

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M.E. ANIMAL SCIENCE, 6TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

MATERIAL COVERS PARASITE PROBLEMS AND CONTROL PROCEDURES IN A GENERAL NATURE, BUT DOES PROVIDE A SOLID FOUNDATION FOR COVERING THE OBJECTIVE OF THIS UNIT.

2. ENSMINGER, M.E. THE STOCKMAN'S HANDBOOK, 2ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1960, 667 PAGES.

   THIS IS A COMPREHENSIVE REFERENCE DEALING WITH MANY FACETS OF LIVESTOCK PRODUCTION. THE SECTION ON ANIMAL HEALTH INCLUDES SOURCE OF CONTROL, PREVENTION AND TREATMENT PROCEDURES FOR COMMON PARASITE PROBLEMS. CARE SHOULD BE TAKEN THAT TREATMENT AND CONTROL RECOMMENDATIONS ARE UP-TO-DATE AND MEET LEGAL RESTRICTIONS.

3. PFIZER, CHARLES. ANIMAL HEALTH HANDBOOK. NEW YORK, NEW YORK: PFIZER CHEMICAL COMPANY.

   A TEXT WHICH DISCUSSES ANIMAL HEALTH PROBLEMS IN DETAIL AND WOULD BE USEFUL AS A TEACHER OR STUDENT REFERENCE.

4. PUBLICATIONS AND BULLETINS FROM THE U.S.D.A. AND COOPERATIVE EXTENSION SERVICE ARE AVAILABLE WHICH OUTLINE PREVENTION AND CONTROL PROCEDURES FOR SPECIFIC PARASITES IN VARIOUS CLASSES OF LIVESTOCK. THESE SHOULD BE ACQUIRED SO AS TO PROVIDE AN UP-TO-DATE REFERENCE FOR LIVESTOCK COMMON TO THE LOCAL AREA.

DETECTING AND CONTROLLING HEALTH DISORDERS DUE TO POISONOUS PLANTS

UNIT CONCEPT: CERTAIN PLANTS CAN BE POISONOUS TO LIVESTOCK WHICH, IN TURN, CAN CAUSE DEATH AND ECONOMIC LOSS TO THE PRODUCER. THE PRODUCER MUST BE ABLE TO RECOGNIZE THE CONDITIONS THAT INDICATE POISONING AND DETERMINE WHAT MEASURES OR PRACTICES SHOULD BE IMPLEMENTED TO CONTROL OR PREVENT THE RECURRENCE OF THIS SITUATION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN ANIMALS THAT HAVE INGESTED POISONOUS PLANTS AND A REFERENCE DESCRIBING THE SYMPTOMS AND TREATMENTS OF VARIOUS DISORDERS, DETERMINE THE CAUSE OF DAMAGE, AND THE RECOMMENDED TREATMENT AND CONTROL MEASURES NECESSARY TO REMEDY THE SITUATION.

2. WHEN GIVEN A LIST OF PLANTS COMMON TO THE AREA, AND REFERENCES, DETERMINE WHICH ONES ARE A THREAT TO LIVESTOCK HEALTH, THE SPECIES THAT CAN BE AFFECTED AND THE PREVENTIVE MEASURES WHICH WOULD REDUCE THE THREAT TO THE LIVESTOCK.

3. WHEN GIVEN ANIMALS SUSPECTED OF BEING IN ILL HEALTH AS A RESULT OF POISONOUS PLANTS, DEMONSTRATE OR DESCRIBE THE TREATMENT THAT SHOULD BE ADMINISTERED TO THE ANIMAL WHILE WAITING FOR THE VETERINARIAN.

B. INSTRUCTIONAL AREAS

1. DETECTING CONDITIONS WHICH MAY INDICATE PLANT POISONING
    A. DETERMINING IMPORTANCE OF PREVENTING LOSSES BY PLANT POISONING
    B. SURVEYING LIVESTOCK AREAS FOR POISONOUS PLANTS
    C. RECOGNIZING SIGNS OF PLANT POISONING IN LIVESTOCK
        (1) NOTING A SUDDEN ONSET OF DISEASE WITHOUT VISIBLE CAUSE
        (2) NOTING IF A NUMBER OF ANIMALS SHOW ACUTE NERVOUS SYSTEM DISORDERS WITHOUT FEVER

(3) NOTING RAPID HEART ACTION, STOMACH AND INTESTINAL IRRITATION OR GENERAL DISCOMFORT
(4) BREATHING DIFFICULTIES AND COLLAPSE

D. DETERMINING INTENSITY OF DAMAGE DUE TO PLANT POISONING

(1) DETERMINING KIND AND AMOUNT OF PLANT EATEN
(2) DETERMINING STAGE OF GROWTH OF INGESTED PLANT
(3) DETERMINING TOLERANCE OF LIVESTOCK SPECIES TO VARIOUS POISONOUS PLANTS
(4) ACQUIRING PROFESSIONAL ASSISTANCE FOR COMPLETE DIAGNOSIS OF PROBLEM

2. PROVIDING TREATMENT TO AFFECTED ANIMALS UNTIL PROFESSIONAL ASSISTANCE (VETERINARIAN) ARRIVES

A. TRANSFERRING ANIMALS TO AREAS WHERE ADEQUATE TREATMENT MAY BE GIVEN

B. KEEPING ANIMALS QUIET AND COMFORTABLE

C. DETERMINING IF ANY EMERGENCY TREATMENT IS RECOMMENDED DURING THIS PERIOD

D. DETERMINING EMERGENCY TREATMENT MATERIALS AND TECHNIQUES FOR VARIOUS PLANTS

3. CONTROLLING AND PREVENTING DAMAGE TO POISONOUS PLANTS

A. DETERMINING IMPORTANCE OF PREVENTING LOSSES BY PLANT POISONING

B. DETERMINING WHAT POISONOUS PLANTS ARE COMMON TO THE AREA

(1) STUDYING DRAWINGS, PHOTOGRAPHS AND/OR DESCRIPTIONS OF POISONOUS PLANTS
(2) CHECKING WITH LOCAL AUTHORITIES FOR UP-TO-DATE INFORMATION
(3) SENDING SUSPECTED WHOLE PLANTS TO AGRICULTURAL COLLEGES TO DETERMINE IF POISONOUS

C. USING GOOD PASTURE OR RANGE MANAGEMENT TO REDUCE POSSIBILITY OF POISONOUS PLANT GROWTH

(1) DETERMINING WHICH SPECIES CAN BE GRAZED AND NOT BE HARMED BY VARIOUS POISONOUS PLANTS
(2) DETERMINING EFFECTS OF OVERGRAZING ON PLANT POISONING
(3) DETERMINING STAGE OF GROWTH POISONING POTENTIAL IS GREATEST

(4) MOWING AND CLIPPING PRACTICES WHICH WILL REDUCE THREAT OF POISONING

D. KNOWING SYMPTOMS THAT INDICATE PLANT POISONING TO ALLOW FOR EARLY ACTION

E. DETERMINING EFFECT OF EARLY SPRING GRAZING ON POSSIBILITY OF POISONING

F. PROVIDING SUPPLEMENTAL FEED DURING DROUGHTS OR AFTER EARLY FROST

G. AVOIDING GRAZING WHEN ANIMALS ARE VERY HUNGRY

H. DETERMINING EFFECT OF LONG LIVESTOCK DRIVES CONDUCTED AT A FAST PACE ON PLANT POPULATION AND POSSIBILITY OF POISONING

I. REMOVING ANIMALS FROM INFESTED AREAS WHEN PLANT POISONING STRIKES

J. ERADICATING POISONOUS PLANTS BY MECHANICAL OR CHEMICAL MEANS AS RECOMMENDED BY PROFESSIONALS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USING DRAWINGS, SLIDES AND PRESERVED OR LIVE PLANT SPECIMENS, HAVE STUDENTS IDENTIFY POISONOUS PLANTS AND DESCRIBE WHAT PROCEDURES OR PRACTICES COULD BE USED TO PREVENT LIVESTOCK FROM BEING POISONED.

2. HAVE STUDENTS MAKE A SURVEY OF HOME FARMS TO DETERMINE WHETHER ANY POISONOUS PLANTS ARE IN AREAS WHERE LIVESTOCK ARE HOUSED OR GRAZED, AND OUTLINE ERADICATION PROGRAMS FOR THOSE PLANTS FOUND.

3. GIVE STUDENTS DESCRIPTIONS OF LIVESTOCK OPERATIONS WITH A NUMBER OF ANIMALS AND PASTURE AVAILABLE AND HAVE STUDENTS OUTLINE A PASTURE ROTATION PROGRAM WHICH WILL MAINTAIN ADEQUATE PASTURE NEEDS AND REDUCE THE THREAT OF POISONOUS PLANT INFESTATION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DETERMINE THE CAUSE OF POISONING, AND THE RECOMMENDED TREATMENT AND CONTROL PROCEDURES NECESSARY TO REMEDY PLANT POISONING IN A GIVEN SPECIES OF LIVESTOCK FOR A LIST OF TEN POISONOUS PLANTS WITH 90% ACCURACY.

2. GIVE STUDENTS A LIST OF PLANTS COMMON TO THE AREA AND HAVE THEM INDICATE THOSE THAT ARE POISONOUS TO LIVESTOCK WITH 95% ACCURACY.

3. HAVE EACH STUDENT DEMONSTRATE OR DESCRIBE EMERGENCY TREATMENT TO ANIMALS SUSPECTED OF PLANT POISONING IN THE INTERIM FROM TIME OF DISCOVERY OF POISONING UNTIL TIME OF ARRIVAL OF PROFESSIONAL ASSISTANCE FOR AT LEAST 5 POISONOUS PLANTS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SPECIMENS (LIVE OR PRESERVED) OF POISONOUS PLANTS

2. REFERENCES OUTLINING CONTROL PROCEDURES AND PRACTICES

3. MATERIALS OR CHEMICALS USED TO KILL OR CONTROL POISONOUS PLANTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK, 2ND EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1960, 667 PAGES.

   MATERIAL IS IN CHART FORM WHICH INCLUDES PLANTS, PLANT DESCRIPTION, ANIMALS AFFECTED, PLANT PARTS THAT ARE POISONOUS, SYMPTOMS, PREVENTION AND TREATMENT FOR A COMPREHENSIVE LIST OF PLANTS POISONOUS TO LIVESTOCK.

2. INFORMATION FROM LOCAL SOURCES SUCH AS COOPERATIVE EXTENSION SERVICE IS NECESSARY TO ACQUIRE IN ORDER TO HAVE UP-TO-DATE INFORMATION REGARDING RECOMMENDED AND LEGAL METHODS OF POISONOUS PLANT ERADICATION AND/OR CONTROL.

SUPPLY AND DEMAND IN MARKETING AND PRICE TRENDS AND CYCLES

UNIT CONCEPT: THE CONCEPT OF THE INTERACTION OF SUPPLY AND DEMAND HAS A GREAT DEAL TO DO WITH THE PRICE RECEIVED AT THE MARKET FOR LIVESTOCK. LIKEWISE, PRICE TRENDS AND CYCLES ARE RELATED TO SUPPLY AND DEMAND. THE LIVESTOCK PRODUCER MUST BE FAMILIAR WITH THESE CONCEPTS IN ORDER TO PLAN HIS MARKETING PROGRAM IN AN EFFORT TO REALIZE THE GREATEST RETURN.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT WILL BE ABLE TO:

1. WHEN GIVEN SUPPLY AND DEMAND SCHEDULES AND NUMBER OF LIVESTOCK TO BE SOLD, DETERMINE THE PRICE AND TOTAL RETURN EXPECTED BY CONSTRUCTING SUPPLY/DEMAND CURVES.

2. THROUGH MARKET REPORTS FOR A FIVE YEAR PERIOD FOR A GIVEN LIVESTOCK SPECIES, DETERMINE THE CYCLIC PATTERN FOR PRICES AND THE MOST FEASIBLE TIME FOR MARKETING FOR THE GIVEN ANIMALS CONSIDERING THE CYCLIC PATTERN AND THE SUPPLY AND DEMAND FOR THE PARTICULAR LIVESTOCK.

B. INSTRUCTIONAL AREAS

1. DETERMINING EFFECT OF DEMAND ON MARKETS
   - A. DEFINING DEMAND
   - B. DEVELOPING A DEMAND CURVE FOR A LIVESTOCK SPECIES
   - C. CHANGING THE DEMAND CURVE THROUGH A CHANGE IN PERSONAL PREFERENCE.
   - D. DETERMINING RELATIONSHIP OF SEASON OF YEAR OR ENVIRONMENT ON MARKET DEMAND
   - E. DETERMINING EFFECT OF ELASTICITY AND INELASTICITY ON DEMAND
2. DETERMINING EFFECT OF SUPPLY ON MARKETS
   - A. DEFINING SUPPLY

B. DEVELOPING A SUPPLY CURVE FOR VARIOUS LIVESTOCK

C. CHANGING THE SUPPLY SCHEDULE THROUGH TECHNOLOGY

D. CHANGING THE SUPPLY CURVE THROUGH TECHNOLOGY

E. DETERMINING THE RELATIONSHIP BETWEEN SUPPLY AND PRICE

F. DETERMINING EFFECT OF ELASTICITY AND INELASTICITY ON DEMAND

3. PRICE DETERMINATION THROUGH INTERACTION OF SUPPLY AND DEMAND

A. COMBINING DEMAND AND SUPPLY SCHEDULES

B. DETERMINING PRICE USING DEMAND AND SUPPLY CURVES

(1) DETERMINING SHORTAGES AND SURPLUSES WITH DEMAND AND SUPPLY CURVE
(2) DETERMINING BUYER REACTION DURING SUPPLY SHORTAGES AND SURPLUSES
(3) DETERMINING RELATION OF EQUILIBRIUM PRICE AND SUPPLY-DEMAND CURVE

C. PRICE DETERMINATION AS INFLUENCED BY SEASONAL PRODUCTION-COMPLEX

D. PRICE DETERMINATION AS INFLUENCED BY A FREE MARKET-COMPLEX

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS CONSTRUCT DEMAND CURVES FOR A GIVEN LIVESTOCK SPECIES. PROVIDE THEM WITH DEMAND SCHEDULES WHICH INCLUDE PRICE PER UNIT AND QUANTITY PURCHASED.

B. GIVE STUDENTS INFORMATION ABOUT PRICE PER UNIT AND AMOUNT OF LIVESTOCK (UNITS) PURCHASED BEFORE AND AFTER A SIMULATED TECHNOLOGICAL ADVANCE AND HAVE THEM CONSTRUCT A SUPPLY CURVE AND CALCULATE THE DIFFERENCES IN SUPPLY BETWEEN THE TWO SCHEDULES.

2. USING MARKET REPORTS ON A LIVESTOCK SPECIES FOR TWO DIFFERENT YEARS HAVE STUDENTS PLOT THE TWO CYCLES ON A GRAPH BY MONTHS AND THEN INTERPRET POSSIBLE REASONS FOR THE DIFFERENCES BETWEEN THE TWO. THIS MAY BE A GOOD METHOD TO DETERMINE POSSIBLE EFFECTS OF "PHASE IV" ON LIVESTOCK PRICES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE STUDENTS INFORMATION ABOUT A PARTICULAR LIVESTOCK SPECIES FOR TWO DIFFERENT MONTHS WHICH INCLUDES PRICE PER HEAD AND NUMBER OF HEAD PURCHASED. (THIS INFORMATION MAY BE ACQUIRED FROM YOUR STATE LIVESTOCK MARKETING SERVICE OR IT COULD BE GENERATED BY THE TEACHER IF DESIRABLE.) THEN HAVE STUDENTS DETERMINE THE PERCENT INCREASE IN DEMAND BETWEEN THE TWO PARTICULAR MONTHS.

2. THE STUDENT MUST BE ABLE TO CONSTRUCT A GRAPH ILLUSTRATING PRICE TRENDS AND CYCLES FOR SPECIFIC LIVESTOCK AND TO ESTIMATE WITHIN ONE MONTH WHEN THE ANIMALS SHOULD BE MARKETED TO REALIZE THE GREATEST RETURN.

E. INSTRUCTIONAL MATERIALS AND EQUIPMENT

1. GRAPH PAPER FOR PLOTTING CURVES

2. MARKET REPORTS FROM NEWSPAPERS, COOP EXTENSION SERVICE OR U.S.D.A. FOR SEVERAL YEARS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL MARKETING PRINCIPLES. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, PP. 21-84.

   A PUBLICATION WRITTEN FOR THE TEACHER WHICH PROVIDES ACTIVITIES AND EXPERIENCES DESIGNED TO DEVELOP A WORKING UNDERSTANDING OF THE CONCEPTS OF SUPPLY-DEMAND-PRICE DETERMINATION.

2. ENSMINGER, M.E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 260-264.

   MATERIAL COVERED IS OF A GENERAL NATURE CONCERNING THE EFFECT OF SUPPLY AND DEMAND ON MARKET PRICES.

MARKET CLASSES AND GRADES OF LIVESTOCK

UNIT CONCEPT: BY HAVING A WORKING KNOWLEDGE OF MARKET CLASSES AND GRADES OF LIVESTOCK, THE PRODUCER WILL BE ABLE TO MORE INTELLIGENTLY PLACE HIS BREEDING AND FEEDING OPERATIONS IN LINE WITH MARKET DEMANDS AND HE CAN SELECT THE MARKET ON WHICH HE IS LIKELY TO SECURE THE BEST RETURNS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DETERMINE THE MARKET CLASS MOST APPROPRIATE FOR A GROUP OF ANIMALS OF VARYING SPECIES ACCORDING TO AGE, GENERAL USE, SEX AND WEIGHT.

2. WHEN GIVEN A GROUP OF ANIMALS OF VARYING SPECIES AND THEIR INTENDED USE, DETERMINE THE MARKET GRADE(S) MOST APPROPRIATE FOR THE ANIMALS ACCORDING TO CONFORMATION, FINISH AND QUALITY.

B. INSTRUCTIONAL AREAS

1. DETERMINING MARKET CLASSES OF LIVESTOCK

   A. DETERMINING IMPORTANCE OF CLASSIFYING LIVESTOCK FOR MARKETING PURPOSES

   B. IDENTIFYING MARKET CLASSES FOR VARIOUS LIVESTOCK SPECIES

   C. DETERMINING FACTORS USED FOR CLASSIFYING LIVESTOCK

      (1) USE
      (2) SEX
      (3) AGE
      (4) WEIGHT DIVISIONS AND POUNDS

   D. USING CLASSIFICATION FACTORS TO DETERMINE APPROPRIATE MARKET CLASS

2. DETERMINING MARKET GRADES OF LIVESTOCK

   A. DETERMINING THE PURPOSES FOR GRADING LIVESTOCK

B. IDENTIFYING MARKET GRADES FOR VARIOUS LIVESTOCK SPECIES

C. DETERMINING INDICATORS OF MARKET GRADE AND THEIR COMPONENTS

(1) CONFORMATION
(2) FINISH
(3) QUALITY

D. USING GRADE INDICATORS TO DETERMINE MARKET GRADES FOR LIVESTOCK

E. DETERMINING YIELD GRADE FOR SLAUGHTER ANIMALS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS BRING IN LIVESTOCK MARKET SUMMARIES FROM NEWSPAPERS AND COMPARE THE PRICES PAID FOR THE VARIOUS CLASSES AND GRADES.

   B. IF POSSIBLE, VISIT A LOCAL PACKING HOUSE AND GRADE LIVESTOCK BEFORE SLAUGHTER AND THEN COMPARE ESTIMATED GRADE WITH OFFICIAL GRADE AFTER SLAUGHTER.

2. A. VISIT A LIVESTOCK STOCKYARD AND HAVE STUDENTS CLASSIFY AND GRADE LIVESTOCK OF VARYING SPECIES.

   B. USING CHARTS, PICTURES, DRAWINGS OF VARIOUS LIVESTOCK, HAVE STUDENTS GRADE (OR JUDGE) THE PICTURES ON THE BASIS OF THE INDICATORS OF MARKET GRADE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING SLIDES, PICTURES OR LIVE ANIMALS, HAVE STUDENTS DETERMINE THE MOST APPROPRIATE MARKET CLASS FOR EACH ACCORDING TO U.S.D.A. STANDARDS WITH 90% ACCURACY.

2. HAVE STUDENTS MATCH A LIST OF MARKET GRADES WITH PICTURES OR OTHER VISUALS OF ANIMALS OF VARYING SPECIES. THIS EXERCISE SHOULD BE COMPLETED WITH AT LEAST 90% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MARKET SUMMARIES

2. ILLUSTRATIONS OF VARIOUS MARKET GRADES OF LIVESTOCK

3. PICTURES, SLIDES OR SOURCE OF LIVESTOCK FOR EXPERIENCE IN DETERMINING CLASSES AND GRADES FOR MARKET ANIMALS.

F. EXAMPLES OF SUPPORTING REFERENCES

1. BASIC CURRICULUM GUIDE FOR PRODUCTION AGRICULTURE - V.A. I. COLLEGE STATION, TEXAS: AGRICULTURAL EDUCATION MATERIALS CENTER, TEXAS A & M UNIVERSITY.

   THE SECTION ON ANIMAL SCIENCE CONTAINS A VAST AMOUNT OF TECHNICAL INFORMATION AND TRANSPARENCIES THAT COULD BE GUITE HELPFUL IN DEALING WITH THE OBJECTIVES OF THIS UNIT. MATERIAL COVERS ALL CLASSES AND GRADES OF LIVESTOCK.

2. COOPERATIVE EXTENSION SERVICES AND THE U.S.D.A. PUBLICATIONS WHICH DESCRIBE THE VARIOUS LIVESTOCK MARKETING CLASSES AND GRADES.

3. ENSMINGER, M.E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969.

   A GENERAL DISCUSSION OF THE CONTENT OF THIS UNIT IS FOUND ON PP. 221-269; HOWEVER SPECIFIC INFORMATION AND MATERIAL FOR EACH LIVESTOCK SPECIES IS FOUND IN OTHER SECTIONS OF THIS BOOK.

SELECTING APPROPRIATE LIVESTOCK MARKETING METHODS

UNIT CONCEPT: THE MARKETING SYSTEM IS A VERY COMPLEX PROCESS IN THE COUNTRY TODAY. LIVESTOCK MARKETS ESTABLISH VALUES FOR ALL ANIMALS; THEREFORE, THE LIVESTOCK PRODUCER MUST BE FAMILIAR WITH THE TYPES OF METHODS AVAILABLE AND BE ABLE TO MAKE A DECISION CONCERNING THE FEASIBILITY OF USING EACH METHOD.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A LIST OF AVAILABLE MARKETS IN THE LOCAL AREA AND A NUMBER OF ANIMALS TO BE MARKETED, DETERMINE THE MOST APPROPRIATE METHOD TO USE CONSIDERING SERVICES OFFERED, SELLING COSTS, COMPETITION AND RETURN.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING AVAILABLE METHODS FOR MARKETING LIVESTOCK
    - A. TERMINAL MARKETS
    - B. AUCTION MARKETS
    - C. COUNTRY SELLING
    - D. SELLING ON BASIS OF CARCASS GRADE AND WEIGHT
2. DETERMINING CHARACTERISTICS OF TERMINAL MARKETS
    - A. DEFINING TERMINAL MARKETS AND IDENTIFYING LOCATIONS
    - B. DETERMINING IMPORTANCE OF TERMINAL MARKETS IN RELATION TO OTHER MARKETING CHANNELS
    - C. DETERMINING ADVANTAGES OF TERMINAL MARKETS
    - D. DETERMINING TERMINAL MARKETING PROCEDURES
    - E. DETERMINING MARKETING COSTS FOR TERMINAL MARKETS
3. DETERMINING CHARACTERISTICS OF AUCTION MARKETS
    - A. DEFINING MEANING OF AUCTION MARKETS

B. IDENTIFYING LOCATION OF AUCTION MARKETS IN LOCAL AREA

C. OUTLINING THE MARKETING PROCEDURE FOR AUCTIONS

D. DETERMINING ADVANTAGES OF AUCTIONS AS A MARKETING METHOD

E. DETERMINING ANY CHARGES FOR USING AUCTIONS TO MARKET LIVESTOCK

4. MARKETING LIVESTOCK THROUGH COUNTRY OR DIRECT SELLING

   A. DEFINING COUNTRY-ORDERED SELLING

   B. IDENTIFYING LOCAL DEALERS IN THE COMMUNITY

   C. PROCEDURE FOR SELLING DIRECTLY TO PACKER

5. SELLING ON BASIS OF CARCASS GRADE AND WEIGHT

   A. DETERMINING ADVANTAGES AND PURPOSES OF THIS METHOD OF MARKETING

   B. DETERMINING FEDERAL REGULATIONS FOR SELLING BY THIS METHOD

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. FROM NEWSPAPER MARKET REPORTS, HAVE THE STUDENTS COMPARE THE MARKET PRICES AT VARIOUS CENTRAL AND LOCAL MARKETS AND THEN EXPLAIN DIFFERENCES IN TERMS OF DISTANCE, COST, COMPETITION.

   B. HAVE STUDENTS IDENTIFY AVAILABLE MARKETS IN THE LOCAL AREA AND THEN, WITH A GIVEN GROUP OF ANIMALS, HAVE STUDENTS FIGURE RETURN AND COST IN TERMS OF CHARGES, AND COMMISSIONS.

   C. VISIT A LOCAL STOCKYARD (AUCTION) AND DETERMINE THE BEGINNING AND FINAL SELLING PRICE FOR VARIOUS SPECIES OF LIVESTOCK TO DETERMINE HOW MUCH COMPETITION WAS EXHIBITED DURING THE SALE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS MATCH MOST APPROPRIATE AVAILABLE TYPE OF MARKETING METHOD WITH GIVEN SITUATIONS WHICH SPECIFY NUMBER OF ANIMALS TO BE MARKETED, MARKETING COSTS OR CHARGES, COMPETITION EXPECTED AND ESTIMATED RETURN.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MARKET REPORTS FROM NEWSPAPERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL MARKETING PRINCIPLES. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, PP. 1-20.

   THIS REFERENCE IS A PUBLICATION WRITTEN FOR TEACHERS WHICH INCLUDES ACTIVITIES FOR STUDYING GENERAL PRINCIPLES OF MARKETING AGRICULTURAL PRODUCTS.

2. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1961, PP. 323-243.

   MATERIAL COVERED IS OF A GENERAL NATURE CONCERNING VARIOUS METHODS AND CONSIDERATIONS IN MARKETING LIVESTOCK.

PREPARING AND HANDLING LIVESTOCK FOR MARKETING

UNIT CONCEPT: IMPROPER PREPARATION AND HANDLING OF LIVESTOCK IMMEDIATELY PRIOR TO AND DURING SHIPMENT TO MARKET MAY RESULT IN EXCESS SHRINKAGE; HIGH DEATH, BRUISE AND CRIPPLING LOSSES; DISAPPOINTING SALES; AND DISSATISFIED BUYERS. THE LIVESTOCK PRODUCER MUST DETERMINE THOSE PROCEDURES AND/OR PROCESSES TO USE IN ORDER TO REDUCE THESE POSSIBLE LOSSES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN ANIMALS READY FOR MARKET, DETERMINE THE MOST APPROPRIATE METHOD OF SHIPMENT (TRUCK OR RAIL) BASED UPON MILEAGE, COST AND AVAILABILITY AND DETERMINE WHETHER ANY HEALTH CERTIFICATES, PERMITS AND/OR BRAND INSPECTIONS ARE NEEDED BEFORE SHIPMENT.

2. WHEN GIVEN ANIMALS READY FOR MARKET, DETERMINE THE FEEDING/WATERING PRACTICES NECESSARY TO AVOID EXCESSIVE FILL.

3. WHEN GIVEN ANIMALS READY FOR SHIPMENT, DEMONSTRATE THE HANDLING PROCEDURES AND/OR PROCESSES NEEDED TO AVOID OR REDUCE SHRINKAGE, BRUISES, CRIPPLING AND/OR DEATH LOSSES.

B. INSTRUCTIONAL AREAS

1. PREPARING ANIMALS FOR MARKETING

    A. SELECTING METHODS OF TRANSPORTATION

        (1) ANALYZING COST OF TRUCK VS. RAIL TRANSPORTATION
        (2) DETERMINING DISTANCE TO BE TRAVELLED TO MARKET
        (3) DETERMINING NUMBER AND TYPE OF LIVESTOCK TO BE MARKETED

    B. DETERMINING FEEDING AND WATERING PRACTICES PRIOR TO SHIPMENT

        (1) DETERMINING EFFECT OF EXCESSIVE FILL ON LIVESTOCK
        (2) IDENTIFYING TECHNIQUES OR METHODS OF PREVENTING EXCESSIVE FILL
        (3) WATERING PRACTICES BEFORE SHIPMENT

C. DETERMINING STATE REGULATIONS RELATIVE TO HEALTH CERTIFICATES, PERMITS AND BRAND INSPECTIONS NEEDED FOR LEGAL LIVESTOCK SHIPMENT

D. VACCINATING PRIOR TO SHIPMENT FOR "SHIPPING FEVER"

2. AVOIDING SHIPPING LOSSES IN LIVESTOCK

A. IDENTIFYING TYPES OF POSSIBLE LIVESTOCK SHIPPING LOSSES

B. DETERMINING HANDLING PROCEDURES TO REDUCE CRIPPLING AND BRUISING LIVESTOCK

(1) DEHORNING CATTLE AS RELATED TO LOSSES
(2) SPEED OF MOVEMENT WHEN MOVING AND LOADING
(3) PROVIDING FOR SOUND FOOTING
(4) USING CANES AND CLUBS VS. OTHER METHODS
(5) LOADING PROCEDURES TO AVOID CRIPPLING (SPACE/ ANIMAL)

C. DETERMINING FACTORS AFFECTING SHRINKAGE AND PROCEDURES TO REDUCE LOSSES

(1) FEED AND WATER CONSUMPTION
(2) TIME AND DISTANCE IN TRANSIT
(3) TYPE OR METHOD OF TRANSPORT
(4) SEASON OF YEAR
(5) AGE AND WEIGHT OF ANIMAL
(6) OVERLOADING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USING SIMULATION, CREATE A SITUATION IN WHICH STUDENTS HAVE A SPECIFIC NUMBER AND SPECIES OF LIVESTOCK TO BE MARKETED AND THE LOCATION OF AVAILABLE MARKETS. THEN, BY GROUPS AND THROUGH DETERMINATION OF COST OF TRANSPORTATION, MILEAGE AND OTHER FACTORS DISCUSSED, HAVE THEM DETERMINE IF ANIMALS SHOULD BE MARKETED BY TRUCK OR RAIL.

2. HAVE STUDENT GROUPS MAKE A CHECKLIST OF PROCEDURES TO FOLLOW WHEN PREPARING AND SHIPPING LIVESTOCK, SUCH AS, TIME AND AMOUNT OF FEEDING AND WATERING, TIME TO CHECK ON HEALTH REGULATIONS, WHEN VACCINATION SHOULD BE DONE AND HANDLING PROCEDURES.

3. A. VISIT A LOCAL STOCKYARD AUCTION AND HAVE STUDENTS MAKE NOTE OF NUMBER OF TIMES ANIMALS ARE "HIT" OR "PUNCHED" AND THEN DRAW CONCLUSIONS AS TO POSSIBLE

DAMAGE DONE AND DOLLAR LOSS.

B. VISIT A PACKING PLANT AND INSPECT OR OBSERVE CARCASSES THAT ARE BRUISED AND THEN ESTIMATE DOLLAR LOSS DUE TO DAMAGE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENT DETERMINE THE MOST APPROPRIATE METHOD OF SHIPPING LIVESTOCK TO MARKET (TRUCK OR RAIL) AND ANY NECESSARY HEALTH CERTIFICATES OR PERMITS TO MEET STATE REGULATIONS FOR A GIVEN CLASS OF LIVESTOCK WITH 95% ACCURACY.

2. EACH STUDENT SHOULD LIST THOSE FEEDING AND WATERING PRACTICES NECESSARY TO REDUCE LOSSES DUE TO SHRINKAGE FOR A GIVEN CLASS OF LIVESTOCK.

3. HAVE EACH STUDENT DEMONSTRATE THOSE HANDLING PROCEDURES WHICH WILL REDUCE LOSSES DUE TO SHRINKAGE, BRUISES, CRIPPLING AND/OR DEATH FOR ANY GIVEN CLASS OF LIVESTOCK. EVALUATE STUDENTS ON THE BASIS OF MATERIAL COVERED IN CLASS DISCUSSION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. VARIOUS TYPES OF HANDLING EQUIPMENT - "HOT-SHOTS", CANES

2. VISUALS OF BRUISED AND DAMAGED CARCASSES

3. TABLES COMPARING COST OF VARIOUS TRANSPORTATION METHODS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ADVANCED LIVESTOCK PRODUCTION UNITS. COLUMBIA, MISSOURI: INSTRUCTIONAL MATERIALS LABORATORY, UNIVERSITY OF MISSOURI.

   THESE UNITS CAN BE PURCHASED WHICH DEAL WITH VARIOUS GROUPS OF LIVESTOCK, SUCH AS, FEEDER PIG PRODUCTION, COW-CALF PRODUCTION, FINISHING CATTLE.

2. ENSMINGER, E. A. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 221-268.

   THIS SECTION OF THIS TEXT COVERS HANDLING LIVESTOCK IN A GENERAL NATURE AS WELL AS SOME DISCUSSION OF TRANSPORTATION METHODS AND CONSIDERATIONS.

MARKETING MILK AND DAIRY PRODUCTS

UNIT CONCEPT: IN OUR PRESENT SYSTEM, THE MARKETING OF MILK AND DAIRY PRODUCTS IS HANDLED LARGELY BY SPECIALISTS, USUALLY UNDER A MULTITUDE OF REGULATIONS AND CONTROLS. HOWEVER, THE SUCCESSFUL MILK PRODUCER MUST UNDERSTAND MILK MARKETS AND THE FACTORS AFFECTING THEM IF HE IS TO TAKE FULL ADVANTAGE OF HIS OPPORTUNITIES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE AMOUNT OF MILK TO BE SOLD, BUTTERFAT PERCENTAGE, CURRENT PRICE INFORMATION, AND THE GRADE, DETERMINE THE EXPECTED RETURN FOR THE AMOUNT TO BE SOLD WITH COMPLETE ACCURACY.

2. WHEN GIVEN "PRICE PLANS" OR POSSIBLE METHODS OF MARKETING MILK OR DAIRY PRODUCTS, EXPLAIN THE MEANING OF EACH TO THE SATISFACTION OF THE INSTRUCTOR.

3. DEFINE AND EXPLAIN HOW MILK IS PRICED AND REGULATED BY THE FEDERAL AND STATE GOVERNMENTS AS WELL AS THE INFLUENCE OF COOPERATIVES ON MILK PRICE REGULATIONS.

B. INSTRUCTIONAL AREAS

1. REGULATING MILK AND DAIRY PRODUCTS PRICING
    - A. DETERMINING EFFECT OF FEDERAL MILK MARKETING ORDERS ON PRICES
    - B. IDENTIFYING FEDERAL PRICE SUPPORT PROGRAMS AFFECTING THE MARKETING OF MILK AND DAIRY PRODUCTS
    - C. IDENTIFYING STATES WITH AUTHORITY TO SET MINIMUM FARM PRICES AND/OR RETAIL PRICES AT THE WHOLESALE AND RETAIL LEVEL
    - D. DETERMINING TYPES OF COOPERATIVES INVOLVED IN MARKETING MILK AND DAIRY PRODUCTS AND THEIR EFFECT ON PRICING
2. IDENTIFYING AND SELECTING METHODS OF SELLING FLUID MILK (PRICE PLANS)

A. SELLING BASED UPON QUALITY GRADES

B. SELLING BASED UPON BUTTERFAT TEST

C. SELLING ON THE BASIS OF MILK SOLIDS-NOT-FAT PRICE PLANS

D. SELLING BASED UPON THE GALLON OR QUART PLAN

E. SELLING BASED UPON BLEND PRICE

3. SELLING MILK AND DAIRY PRODUCTS

A. DETERMINING PROJECTED AMOUNT OF MILK TO BE MARKETED

B. IDENTIFYING AVAILABLE MARKETS IN LOCAL AREAS

C. DETERMINING METHODS OF PAYMENT TO BE RECEIVED

D. DETERMINING EXPECTED RETURN FROM SALES

(1) DETERMINING CURRENT PRICES BEING RECEIVED FROM MILK SALES
(2) DETERMINING BUTTERFAT PERCENTAGES
(3) DETERMINING SEDIMENT CONTENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. GIVE STUDENTS SITUATIONS WHICH DEFINE VARIOUS DAIRY OPERATIONS INCLUDING AMOUNTS TO BE SOLD AND BUTTERFAT PERCENTAGE, AND HAVE THEM FIGURE EXPECTED RETURNS.

B. HAVE STUDENTS RUN BUTTERFAT AND SEDIMENT TESTS ON VARIOUS MILK SAMPLES AND THEN DETERMINE WHAT EFFECT THE RESULTS MIGHT HAVE ON EXPECTED RETURNS.

2. A. COMPARE VARIOUS METHODS OF MARKETING MILK OR DAIRY PRODUCTS, SUCH AS, QUALITY GRADE, MILK SOLIDS-NOT-FAT, GALLON AND QUALITY GRADES, AND HAVE STUDENTS IDENTIFY THE ADVANTAGES AND DISADVANTAGES OF EACH METHOD.

B. VISIT A DAIRY PLANT AND HAVE THE PLANT MANAGER EXPLAIN VARIOUS METHODS OF BUYING MILK FROM THE PRODUCER AND THE ADVANTAGES AND DISADVANTAGES OF EACH.

3. HAVE GROUPS OF STUDENTS CONTACT THE U.S. DEPARTMENT OF AGRICULTURE, STATE DEPARTMENT OF AGRICULTURE AND STATE EXTENSION PERSONNEL IN DAIRY PRODUCTS FOR INFORMATION ON REGULATIONS AND PRICE SUPPORT PROGRAMS FOR MILK AND DAIRY PRODUCTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE STUDENTS A SERIES OF SITUATIONS OUTLINING POUNDS AND BUTTERFAT PERCENTAGES, MILK SOLIDS-NOT-FAT PERCENTAGES AND CURRENT PRICE INFORMATION FOR VARIOUS METHODS FOR VARIOUS DAIRY OPERATIONS; HAVE THEM FIGURE THE EXPECTED RETURN FOR EACH SITUATION AND THEN RANK FROM HIGHEST TO LOWEST RETURN.

2. HAVE STUDENTS DEFINE AND WRITE A SHORT SENTENCE EXPLAINING THE FOLLOWING TERMS:

   A. QUALITY GRADE PLAN

   B. BUTTERFAT TEST PLAN

   C. MILK SOLIDS-NOT-FAT PLAN

   THIS ACTIVITY SHOULD BE EVALUATED BY THE INSTRUCTOR FOR COMPREHENSIVENESS AND ACCURACY OF RESPONSE.

3. HAVE STUDENTS LIST AT LEAST THREE FACTORS OR AGENCIES THAT REGULATE THE MARKETING OF MILK AND DAIRY PRODUCTS. THIS LIST SHOULD INCLUDE FEDERAL MILK MARKET ORDERS, STATE CONTROL PROGRAMS, AND COOPERATIVES FOR COMPLETE ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. REFERENCES WHICH DEFINE VARIOUS METHODS OF MARKETING MILK AND DAIRY PRODUCTS

2. CURRENT PRICE INFORMATION CONCERNING MILK AND DAIRY PRODUCTS IN THE LOCAL AREA

3. CENTRIFUGE, ACID AND OTHER EQUIPMENT FOR TESTING BUTTERFAT CONTENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 601-617.

   THIS PUBLICATION GIVES A GENERAL OVERVIEW OF THIS SUBJECT INCLUDING PRICE PLANS AND FEDERAL CONTROLS WHICH INFLUENCE THE MARKETING OF MILK AND DAIRY PRODUCTS.

2. U.S. DEPARTMENT OF AGRICULTURE AND STATE DEPARTMENT OF AGRICULTURE.

SEVERAL PUBLICATIONS ARE AVAILABLE FROM THE ABOVE SOURCES FOR FREE OR A NOMINAL FEE AND CONCERN FEDERAL PRICE SUPPORTS AND GRADING MILK AND DAIRY PRODUCTS.

MARKETING POULTRY AND EGGS

UNIT CONCEPT: THE POULTRY AND EGG PRODUCER MUST BE FAMILIAR WITH THE GRADES, TECHNIQUES AND METHODS OF MARKETING POULTRY PRODUCTS IN ORDER TO REALIZE AN ADEQUATE RATE OF RETURN ON HIS INVESTMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN ILLUSTRATIONS OR ACTUAL BIRDS, DETERMINE THE EXPECTED GRADE OF THE BIRD AT MARKETING TIME TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN GIVEN A GROUP OF EGGS TO BE MARKETED, DETERMINE THROUGH CANDLING AND INSPECTION OR OTHER COMMONLY USED METHOD, THE GRADE AND SIZE CLASSIFICATION OF THE EGGS ACCORDING TO THE STANDARD GRADES.

3. WHEN GIVEN INFORMATION ON THE AMOUNT OF POULTRY AND EGGS TO BE SOLD AND CURRENT PRICE INFORMATION, DETERMINE THE EXPECTED RETURN FOR THE GIVEN PRODUCTS TO THE SATISFACTION OF THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. CLASSIFYING AND GRADING MARKET POULTRY
    - A. IDENTIFYING CHARACTERISTICS OF COMMON CLASSES OF CHICKENS
        - (1) CORNISH GAME HEN
        - (2) BROILER OR FRYER
        - (3) ROASTER
        - (4) CAPON
        - (5) STAG
        - (6) STEWING CHICKENS
        - (7) COCK OR ROOSTER
    - B. GRADING LIVE POULTRY
        - (1) IDENTIFYING CLASSES OR GRADES
        - (2) IDENTIFYING FACTORS DETERMINING GRADE OF BIRD OR FOWL
2. GRADING EGGS
    - A. IDENTIFYING FACTORS THAT DETERMINE VALUE OF EGGS

B. IDENTIFYING AND USING STANDARDS FOR QUALITY OF INDIVIDUAL SHELL EGGS IN GRADING

C. DETERMINING WEIGHT CLASSIFICATIONS FOR EGGS

D. IDENTIFYING THE QUALITY STANDARDS FOR VARYING SETS OF GRADES

(1) CONSUMER GRADES
(2) WHOLESALE GRADES
(3) U.S. PROCUREMENT GRADES

3. MARKETING CONSIDERATIONS FOR POULTRY AND EGGS

A. DETERMINING METHOD OF MARKETING FOR VARIOUS POULTRY CLASSES

B. DETERMINING NUMBERS AND AMOUNT OF PRODUCT(S) TO BE SOLD

C. DETERMINING PRODUCTION SEQUENCE IN RELATION TO EXPECTED MARKETING TIME FOR LIVE POULTRY

D. DETERMINING EXPECTED PRICE TO BE RECEIVED

E. ESTIMATING EXPECTED RETURNS FROM SALE OF POULTRY AND EGGS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USE PICTURES AND/OR LIVE BIRDS AND HAVE STUDENTS PRACTICE GRADING LIVE POULTRY. AN ADDITIONAL ACTIVITY MIGHT BE TO GRADE READY-TO-COOK POULTRY AND COMPARE RELATIONSHIP OF LIVE GRADING TO GRADING CARCASSES.

2. HAVE STUDENTS SET UP AN EXPERIMENT BY COMPARING EGGS THAT ARE VARYING AGES IN DAYS ACCORDING TO THE GRADE. HAVE THEM DETERMINE HOW LONG IT TAKES FOR AN EGG TO CROP FROM GRADE A TO C. THIS ACTIVITY WILL ALSO ASSIST THEM IN DEVELOPING THE ABILITY TO CANDLE AND GRADE EGGS.

3. A. HAVE STUDENTS COMPARE THE ADVANTAGES AND DISADVANTAGES OF MARKETING POULTRY THROUGH VARIOUS CHANNELS.

B. SET UP MARKETING SITUATIONS FOR A GIVEN NUMBER OF BROILERS OR LAYING HENS AND HAVE THEM DETERMINE THE EXPECTED RETURNS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS LIST THE CRITERIA USED IN DETERMINING MARKET GRADES OF LIVE POULTRY. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY:

    A. HEALTH AND VIGOR,

    B. FEATHERING,

    C. CONFORMATION,

    D. FLESHING,

    E. FAT COVERING, AND

    F. DEFECTS.

2. SET UP AN EXERCISE USING A NUMBER OF VARIOUS GRADES OF EGGS AND HAVE STUDENTS DETERMINE THE GRADE OF EACH BY CANDLING TO DETERMINE INTERNAL QUALITY AND THROUGH VISUAL INSPECTION FOR SHELL QUALITY. THEIR LEVEL OF ACCURACY SHOULD BE AT LEAST 90%.

3. FOR VARIOUS NUMBERS OF LIVE POULTRY AND EGGS, HAVE STUDENTS FIGURE EXPECTED RETURNS BASED UPON CURRENT PRICE INFORMATION WITH COMPLETE ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. REFERENCES OR MARKET REPORTS WHICH GIVE CURRENT PRICES FOR LIVE MARKET POULTRY AND EGGS

2. CANDLING EQUIPMENT

3. EGG SCALES

F. EXAMPLES OF SUPPORTING REFERENCES

1. EGG GRADING MANUAL. AGRICULTURE HANDBOOK NO. 75. WASHINGTON, D.C.: AGRICULTURAL MARKETING SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1970.

    A COMPREHENSIVE MANUAL WHICH OUTLINES THE PROCEDURE AND TECHNIQUES FOR GRADING EGGS BASED UPON THE FEDERAL STANDARDS.

2. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 1061-1075.

THIS TEXT COVERS, IN A GENERAL NATURE, THE MATERIAL COVERED IN THIS UNIT INCLUDING GRADING LIVE POULTRY AND EGGS, MARKETING CHANNELS AND SELLING ARRANGEMENTS AND FINANCIAL ASPECTS FOR CONSIDERATION.

3. POULTRY GRADING MANUAL. AGRICULTURE HANDBOOK NO. 31. WASHINGTON, D.C.: AGRICULTURAL MARKETING SERVICE, U.S. DEPARTMENT OF AGRICULTURE. 1966.

A SIMILAR PUBLICATION TO REFERENCE NO. 1 EXCEPT THE MATERIAL COVERED IS FOR LIVE AND DRESSED POULTRY INCLUDING TURKEYS AND OTHER FOWL.

SELECTING LIVESTOCK HOUSING

UNIT CONCEPT: LIVESTOCK PERFORM MORE EFFICIENTLY WHEN THEY ARE PROVIDED WITH ADEQUATE HOUSING WITH DESIRABLE ENVIRONMENTAL CONDITIONS. THE LIVESTOCK PRODUCER NEEDS TO BE ABLE TO PLAN AND SELECT HOUSING WHICH WILL PROVIDE ADEQUATE SHELTER, BE ECONOMICAL AND WILL BE EASILY MAINTAINED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE NUMBER AND TYPE OF LIVESTOCK FOR A PROPOSED PRODUCTION PROGRAM IN A GEOGRAPHIC AREA AND WITH THE USE OF REFERENCES, DETERMINE A TYPE AND SIZE OF BUILDING APPROPRIATE IN REGARDS TO MAINTENANCE, ECONOMY OF CONSTRUCTION, EFFICIENT ENVIRONMENTAL CONDITIONS FOR THE ANIMALS, AND EFFICIENT LIVESTOCK AND MATERIALS HANDLING.

2. WHEN GIVEN A MAP, AERIAL PHOTOGRAPH, DRAWING OR OTHER VISUAL DESCRIPTION OF A FARM OR RANCH, AND A SPECIES OF LIVESTOCK, DETERMINE THE MOST DESIRABLE LOCATION, AND NUMBER OF BUILDINGS NEEDED TO PROVIDE ECONOMIC HOUSING TO THE SATISFACTION OF THE TEACHER.

B. INSTRUCTIONAL AREAS

1. DETERMINING HOUSING NEEDS OF LIVESTOCK

   A. DETERMINING IMPORTANCE OF LIVESTOCK HOUSING IN RELATION TO EFFICIENCY

   B. DETERMINING SPECIES OF LIVESTOCK TO BE HOUSED

   C. DETERMINING INTENDED USE OF LIVESTOCK

   D. DETERMINING SPACE REQUIREMENTS FOR SPECIFIC TYPE AND AGE OF LIVESTOCK

      (1) IDENTIFYING FLOOR AREA REQUIRED
      (2) IDENTIFYING CEILING HEIGHT REQUIRED
      (3) SELECTING WINDOW SPACE REQUIRED
      (4) DETERMINING STALL AREA REQUIREMENTS BASED UPON AGE AND PURPOSE OF LIVESTOCK

   E. DETERMINING LIGHTING REQUIREMENTS

F. DETERMINING TEMPERATURE AND HUMIDITY REQUIREMENTS FOR SPECIFIC LIVESTOCK SPECIES

2. ASSESSING EXISTING LIVESTOCK HOUSING

    A. DETERMINING NUMBER OF LIVESTOCK OF GIVEN AGE AND INTENDED USE WHICH COULD BE HOUSED IN EXISTING STRUCTURES

    B. ASSESSING EXISTING LIGHTING AND ELECTRICAL CAPABILITIES

    C. ASSESSING EFFICIENCY OF MANURE DISPOSAL

    D. DETERMINING ACCESS TO WATER SOURCES AND FEED SOURCES

3. DEVELOPING A HOUSING PLAN FOR SPECIFIC LIVESTOCK SPECIES

    A. ASSESSING NEEDS OF SPECIES TO BE HOUSED

    B. DETERMINING LONG-RANGE PLANS FOR EXPANSION

    C. DETERMINING LOCATION OF NEEDED NEW BUILDINGS

    D. IDENTIFYING TYPES OF HOUSING DESIRED

    E. DETERMINING COST OF CONSTRUCTION AND MAINTENANCE OF HOUSING

    F. ANALYZING NEEDS IN RELATION TO CAPITAL INVESTMENT NEEDED FOR DESIRED FACILITIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. GIVE STUDENTS SKETCHES OF FARM BUILDINGS WHICH INCLUDE DIMENSIONS HAVE THEM FIGURE THE NUMBER OF ANIMALS OF A SPECIFIC SPECIES THE BUILDINGS WILL ACCOMODATE.

    B. VISIT SOME OF THE STUDENTS' FARMS AND ANALYZE THE EXISTING LIVESTOCK STRUCTURES IN TERMS OF SPACE REQUIREMENTS, EASE OF MANURE DISPOSAL, PROXIMITY OF WATER AND THEN GIVE SUGGESTIONS FOR IMPROVING EXISTING CONDITIONS.

2. ASSIGN STUDENT GROUPS A SITUATION WITH A SPECIFIC SPECIES OF LIVESTOCK AND THEIR INTENDED USE AND HAVE STUDENTS PLAN A HOUSING PLAN FOR THE HERD. THEY SHOULD ALSO HAVE INFORMATION ABOUT AVAILABLE MARKETS, SIZE OF FARM, CLIMATIC CONDITIONS OF THE REGION AND STORAGE REQUIREMENTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EACH STUDENT SHOULD LIST FACTORS TO CONSIDER WHEN DETERMINING HOUSING NEEDS OF A SPECIFIC LIVESTOCK SPECIES. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) SPECIES OF LIVESTOCK, (2) TYPE OF LIVESTOCK OPERATION, (3) EXISTING ENVIRONMENTAL CONDITIONS, AND (4) SPEACE REQUIREMENTS OF LIVESTOCK TO BE HOUSED.

2. GIVE STUDENTS MAPS, AERIAL PHOTOGRAPHS OR OTHER VISUAL AIDS WHICH SHOW THE LOCATION OF LIVESTOCK HOUSING FACILITIES FOR A SPECIFIC LIVESTOCK SPECIES AND HAVE THEM DETERMINE IF THE SITES SHOWN ARE MOST APPROPRIATE. IF THE SITES ARE INAPPROPRIATE, STUDENTS SHOULD DETERMINE AND JUSTIFY A MORE FEASIBLE LOCATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SKETCHES OF VARIOUS TYPES OF FARM BUILDINGS AND STRUCTURES COMMONLY USED FOR HOUSING

2. REFERENCES DESCRIBING HOUSING REQUIREMENTS FOR SPECIFIC SPECIES OF LIVESTOCK

3. BUILDING PLANS FOR LIVESTOCK HOUSING STRUCTURE

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, 1253 PAGES.

   THIS IS A REFERENCE WHICH COVERS HOUSING IN A GENERAL NATURE WHICH CAN BE EASILY UNDERSTOOD BY STUDENTS.

2. MOST STATES PROVIDE LIVESTOCK BUILDING PLANS FOR SPECIFIC SPECIES OF LIVESTOCK WHICH ARE GENERALLY QUITE ECONOMICAL AND PROVIDE ADEQUATE SHELTER AND LOW MAINTENANCE REQUIREMENTS. THESE ARE AVAILABLE THROUGH THE COOPERATIVE EXTENSION SERVICE.

3. OTHER SOURCES INCLUDE FIRMS OR COMPANIES SPECIALIZING IN FARM BUILDINGS.

MAINTAINING ENVIRONMENTAL CONDITIONS IN LIVESTOCK HOUSING

UNIT CONCEPT: LIVESTOCK PERFORM MORE EFFICIENTLY WHEN ENVIRONMENTAL CONDITIONS ARE OPTIMUM; THEREFORE, THE LIVESTOCK PRODUCER MUST DETERMINE THESE OPTIMUM CONDITIONS AND CARRY OUT THOSE MAINTENANCE PROCEDURES WHICH WILL CREATE AND MAINTAIN A FAVORABLE ENVIRONMENT CONDUCIVE TO EFFICIENT PRODUCTION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A GROUP OF LIVESTOCK AND SUFFICIENT REFERENCES CONTAINING ENVIRONMENTAL STANDARDS, DETERMINE THE ENVIRONMENTAL REQUIREMENTS OF THE LIVESTOCK TO THE SATISFACTION OF THE TEACHER.

2. WHEN GIVEN VARIOUS TYPES OF LIVESTOCK HOUSING, CARRY OUT RECOMMENDED MAINTENANCE PROCEDURES AND/OR PRACTICES WHICH WILL MAINTAIN OPTIMUM ENVIRONMENTAL CONDITIONS FOR LIVESTOCK EFFICIENCY, SUCH AS, EQUIPMENT MAINTENANCE.

B. INSTRUCTIONAL AREAS

1. MAINTAINING TEMPERATURE AND HUMIDITY IN LIVESTOCK HOUSING
   - A. DETERMINING EFFECT OF EXTREME TEMPERATURES ON LIVESTOCK
     - (1) RATE OF GAIN
     - (2) MILK AND EGG PRODUCTION
     - (3) REPRODUCTION
   - B. DETERMINING SPECIFIC LIVESTOCK REQUIREMENTS
   - C. IDENTIFYING METHODS USED TO CONTROL ENVIRONMENTAL CONDITIONS
     - (1) ENVIRONMENTALLY CONTROLLED HOUSING
       - (A) BTU CAPACITY NEEDED
       - (B) OPERATING TIME AND EQUIPMENT
       - (C) ADJUSTING EQUIPMENT

        (2) NATURAL AIR FLOW CONTROLS
        (3) INSULATING AS IT RELATES TO ENVIRONMENTAL FACTORS
        (4) TYPES OF BUILDING STRUCTURES AS EFFECTIVE CONTROLS

    D. SIMPLE MAINTENANCE PROCEDURES FOR HEATING AND COOLING EQUIPMENT

        (1) HEATERS
        (2) VENTILATORS
        (3) CONTROL DEVICES

2. MAINTAINING WATER NEEDS OF LIVESTOCK

    A. DETERMINING AMOUNTS NEEDED AND LOCATING SOURCES OF WATER

    B. SELECTING WATERING FACILITIES

    C. SETTING UP AND REGULATING EQUIPMENT

3. MAINTAINING OPTIMUM LIGHTING

    A. SELECTING VARIOUS LIGHTING EQUIPMENT

    B. INSTALLING LIGHTING EQUIPMENT

    C. MAINTENANCE PROCEDURES FOR LIGHTING EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITES

1. A. ANALYZE BUILDING PLANS FOR GIVEN LIVESTOCK UNDER SPECIFIC CLIMATIC CONDITIONS (MEAN TEMPERATURE, ANNUAL RAINFALL), AND RECOMMEND ANY CHANGES NECESSARY TO ADEQUATELY MEET THE NEEDS OF THE GIVEN LIVESTOCK.

    B. DETERMINE COST OF VARIOUS TYPES OF VENTILATOR SYSTEMS IN RELATION TO OUTPUT. USE VARIOUS SIZES OF FANS TO DETERMINE WHICH COULD BE MOST EFFICENT IN PROVIDING VENTILATION.

2. USE OPERATORS' MANUALS AND HAVE STUDENTS PERFORM RECOMMENDED MAINTENANCE, SUCH AS, OILING, SIMPLE REPAIR ON VARIOUS ENVIRONMENTAL CONTROL EQUIPMENT (FOR EXAMPLE, FANS AND LIGHT FIXTURES).

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST WITH SPECIES OF LIVESTOCK IN ONE COLUMN AND ENVIRONMENTAL CONDITIONS OR FACTORS IN ANOTHER COLUMN AND HAVE STUDENT MATCH THE COLUMNS WITH 90% ACCURACY.

2. STUDENTS SHOULD LIST WITH 90% ACCURACY THE MAINTENANCE PROCEDURES NECESSARY TO MAINTAIN SPECIFIC ENVIRONMENTAL CONTROL EQUIPMENT. THIS LISTING SHOULD BE BASED UPON MANUFACTURERS' RECOMMENDATIONS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. COMMERCIAL CATALOGUES, SLIDE SETS OR OTHER ILLUSTRATIVE MATERIALS WITH ILLUSTRATIONS OF "ENVIRONMENTAL CONTROL" EQUIPMENT. THESE SHOULD INCLUDE HEATERS, FANS, WATERING EQUIPMENT

2. THERMOSTATS AND AUTOMATIC CONTROL DEVICES

3. LIVESTOCK HOUSING PLANS SHOWING LOCATION AND SPECIFICATION FOR WATERING FACILITIES, VENTILATION AND LIGHTING

4. OPERATORS' MANUALS FOR CONTROL DEVICES, FANS AND OTHER TYPES OF EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, E. A. ANIMAL SCIENCE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1969, PP. 165-174.

   THIS IS A COMPREHENSIVE REFERENCE DEALING WITH MANY FACETS OF LIVESTOCK PRODUCTION. THE SECTION ON HOUSING IS GENERAL IN NATURE AND WOULD PROVIDE A FOUNDATION FOR COVERING THE OBJECTIVES OF THIS UNIT.

2. PLANS OF LIVESTOCK HOUSING WHICH INCLUDE PROVISIONS FOR WIRING, LIGHTING AND VENTILATION (FANS) FROM COMMERCIAL COMPANIES. THESE COULD BE USED FOR FEASIBILITY STUDIES TO DETERMINE MOST APPROPRIATE METHODS OF ENVIRONMENTAL CONTROL.

3. COOPERATIVE EXTENSION SERVICE MAY ALSO HAVE UP-TO-DATE INFORMATION AND PLANS AVAILABLE CONCERNING ENVIRONMENTAL CONTROL IN LIVESTOCK HOUSING.

LIVESTOCK AND MATERIALS HANDLING AND STORAGE

UNIT CONCEPT: MEETING THE REQUIREMENTS FOR HANDLING LIVESTOCK AND MATERIALS AS WELL AS PROVIDING ADEQUATE STORAGE FACILITIES WILL RESULT IN THE REDUCTION OF LABOR AND WILL INCREASE THE EFFICIENCY OF THE PRODUCTION OPERATION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE TYPE OF LIVESTOCK OPERATION, THE SIZE OF FARM, AND SUFFICIENT REFERENCES, DETERMINE THE TYPE AND SIZE OF LIVESTOCK HANDLING FACILITIES NEEDED TO PROVIDE FOR EFFICIENT MOVEMENT AND THE REDUCTION OF LIVESTOCK STRESS AND LOSS OF PRODUCTION.

2. WHEN GIVEN THE TYPE AND SIZE OF A LIVESTOCK OPERATION, AND SUFFICIENT REFERENCES, PLAN THE TYPE OF MATERIALS HANDLING EQUIPMENT NECESSARY FOR THE EFFICIENT FLOW AND DISTRIBUTION OF MATERIALS SUCH AS FEED AND MANURE.

3. WHEN GIVEN THE VARIETY OF MATERIALS HANDLING EQUIPMENT, OPERATE THE EQUIPMENT ACCORDING TO THE OPERATOR'S MANUAL.

4. WHEN GIVEN A VARIETY OF MATERIALS HANDLING EQUIPMENT AND/OR STORAGE FACILITIES, PERFORM THE REQUIRED MAINTENANCE PROCEDURES OR PROCESSES AS SPECIFIED BY THE OPERATOR'S MANUAL.

B. BASIC CONTENT

1. PLANNING THE LIVESTOCK HANDLING FACILITIES
    - A. DETERMINING THE TYPE OR SPECIES OF LIVESTOCK TO BE HANDLED
    - B. DETERMINING THE USE TO BE MADE OF THE LIVESTOCK
    - C. ANALYZING THE EXISTING FACILITIES SUCH AS CORRALS, EXERCISE LOTS, AND HANDLING PENS
    - D. EVALUATING THE LONG-RANGE OBJECTIVES AND NEEDS OF THE LIVESTOCK OPERATION

- E. DETERMINING THE SPACE REQUIREMENTS FOR ANIMALS TO BE HANDLED
- F. ESTIMATING COST OF CONSTRUCTION OF NEEDED NEW FACILITIES AND IMPROVEMENTS OF EXISTING FACILITIES

2. PLANNING THE MATERIALS HANDLING SYSTEM AND STORAGE FACILITIES NEEDED

   - A. ANALYZING THE EXISTING MATERIALS HANDLING SYSTEM AND STORAGE FACILITIES
   - B. DETERMINING FEED AND MANURE DISPOSAL REQUIREMENTS
   - C. ESTIMATING THE CAPITAL INVESTMENTS NEEDED TO CONSTRUCT OR IMPROVE EXISTING FACILITIES
   - D. DETERMINING THE ANNUAL OWNERSHIP AND OPERATING COSTS

3. SELECTING THE MATERIALS HANDLING EQUIPMENT AND STORAGE FACILITIES TO INCREASE EFFICIENCY AND REDUCE LABOR

   - A. SELECTING EQUIPMENT FOR CONVEYING FEED AND WASTE MATERIALS INTO STORAGE BASED UPON ASSESSED NEEDS
   - B. SELECTING EQUIPMENT FOR REMOVING FEED AND WASTE MATERIAL FROM STORAGE
   - C. SELECTING FEED PROCESSING EQUIPMENT
   - D. SELECTING FEED DISTRIBUTION EQUIPMENT
   - E. SELECTING STORAGE FACILITIES
     - (1) DETERMINING TYPE OF FEED TO BE STORED
     - (2) DETERMINING PROPORTION OF FEED PRODUCED AND FEED PURCHASED
   - F. SELECTING THE EQUIPMENT FOR HANDLING MILK, EGGS AND OTHER LIVESTOCK PRODUCTS

4. OPERATING AND MAINTAINING THE MATERIALS HANDLING EQUIPMENT AND STORAGE FACILITIES

   - A. USING THE OPERATORS MANUAL FOR PROPER MATERIALS HANDLING OPERATION AND MAINTENANCE
   - B. OBSERVING SAFETY PRECAUTIONS
   - C. LUBRICATING THE EQUIPMENT
   - D. CHECKING FOR WORN AND LOOSE PARTS

E. PREPARING THE EQUIPMENT FOR STORAGE

F. PERFORMING THE NECESSARY MAINTENANCE TO STORAGE FACILITIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS PLAN A CORRAL OR LOT FOR HOLDING AND MOVING LIVESTOCK FOR A SPECIFIC LIVESTOCK SPECIES AND INTENDED USE. THIS COULD BE A PLAN FOR VACCINATION OF CATTLE, HANDLING LIVESTOCK FOR LOADING, OR HOLDING DAIRY ANIMALS BEFORE MILKING.

   B. VISIT AN AREA FARMER TO OBSERVE HIS METHODS OF MATERIALS HANDLING AND STORAGE ARRANGEMENT. ASK IF HE HAS ANY SUGGESTIONS OR PLANS FOR IMPROVEMENTS WHICH HE WOULD SHARE WITH THE CLASS.

2. GIVEN A FARMSTEAD PLAN, EVALUATE THE PLAN AND DETERMINE HOW THE MATERIALS HANDLING AND STORAGE ARRANGEMENT CAN BE IMPROVED.

3. A. VISIT A FARM WITH A FEED HANDLING SYSTEM THAT IS HIGHLY MECHANIZED, ASK THE FARMER TO DEMONSTRATE ITS OPERATION AND MAINTENANCE TO THE CLASS.

   B. ASK STUDENTS TO IDENTIFY THE NECESSARY MAINTENANCE FOR EACH IN RELATION TO LUBRICATION USING OPERATOR'S MANUALS FOR APPROPRIATE TYPES OF MATERIALS HANDLING EQUIPMENT.

4. STUDENTS SHOULD BRING IN A TYPE OF MATERIALS HANDLING EQUIPMENT WHICH THE STUDENTS CAN ADJUST AND LUBRICATE USING THE OPERATOR'S MANUAL.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EACH STUDENT SHOULD LIST THE FACTORS TO CONSIDER WHEN PLANNING LIVESTOCK HANDLING FACILITIES. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) TYPE OF LIVESTOCK, (2) NUMBER OF LIVESTOCK TO BE HANDLED, (3) SPACE REQUIREMENTS PER HEAD, (4) CONDITION OF EXISTING FACILITIES, (5) COST OF CONSTRUCTION OF NEW HANDLING FACILITIES, AND (6) MAINTENANCE COST.

2. FOR A SPECIFIC LIVESTOCK OPERATION, HAVE STUDENTS FIGURE THE TYPE AND SIZE OF MATERIALS HANDLING EQUIPMENT NEEDED TO HANDLE THE EXPECTED VOLUME OF FEED TO BE USED IN THE OPERATION WITH 90% ACCURACY.

3. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO SAFELY OPERATE A SPECIFIC PIECE OF MATERIALS HANDLING EQUIPMENT, SUCH AS A FEEDING SYSTEM, ACCORDING TO THE RECOMMENDATIONS OF THE OPERATOR'S MANUAL.

4. FOR SPECIFIC MATERIALS HANDLING EQUIPMENT, EACH STUDENT SHOULD LUBRICATE, PERFORM SIMPLE REPAIRS, AND ADJUST THE EQUIPMENT ACCORDING TO SPECIFICATIONS OUTLINED IN THE SERVICE MANUAL WITH COMPLETE ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. A TYPE OF MATERIALS HANDLING EQUIPMENT AND THE NECESSARY TOOLS AND EQUIPMENT

2. OPERATOR'S MANUALS FOR APPROPRIATE TYPES OF MATERIALS HANDLING EQUIPMENT

3. TABLES RELATING TO THE STORAGE AREA NECESSARY FOR CROPS AND BEDDING

4. VARIOUS PLANS FOR HANDLING LIVESTOCK EFFICIENTLY FOR VARIOUS SPECIES

F. EXAMPLES OF SUPPORTING REFERENCES

1. HUNT, DONNELL. FARM POWER AND MACHINERY MANAGEMENT. 4TH EDITION. AMES, IOWA: IOWA STATE UNIVERSITY PRESS. 1967, PP. 137-155.

   THIS SECTION CONSIDERS FARM PROCESSING EQUIPMENT INCLUDING REDUCING MACHINES, DRYING MACHINES, AND CONVEYING TYPE MECHANISMS. CONTENT DEALS WITH DESCRIPTIONS OF VARIOUS EQUIPMENT TYPES AS WELL AS PERFORMANCE CAPABILITIES OF THE VARIOUS TYPES OF PROCESSING EQUIPMENT.

2. INDIVIDUAL STUDY GUIDE FOR DRYING CORN ON THE FARM. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970.

   ALTHOUGH CONCERNED PRIMARILY WITH THE DRYING OPERATION, MATERIAL COVERED INCLUDES EQUIPMENT OPERATION AND MAINTENANCE OF VARIOUS DRYING SYSTEMS.

3. PLANNING GRAIN-FEED HANDLING FOR LIVESTOCK AND CASH-GRAIN FARMS. AMES, IOWA: MIDWEST PLAN SERVICE, IOWA STATE UNIVERSITY. 1968, 59 PAGES.

MATERIAL COVERED INCLUDES PRINCIPLES OF FLOW, DRYING SYSTEMS, FEED HANDLING LAYOUTS, STORAGE FACILITIES AND OTHER COMMONLY USED FEED HANDLING SYSTEMS. A RATHER TECHNICAL REFERENCE BEST USED BY THE TEACHER.

HANDLING LIVESTOCK AND POULTRY

UNIT CONCEPT: THE NATURAL HABITS OF LIVESTOCK AND POULTRY OFTEN CAUSE PROBLEMS IN CASES SUCH AS MOVING AND CARING FOR THE ANIMALS, MILKING COWS, SHEARING SHEEP AND HANDLING THE ANIMALS FOR GRADING, SHOWING OR MARKETING. THE LIVESTOCK PRODUCER CAN MANAGE THE LIVESTOCK MORE EFFECTIVELY AND EFFICIENTLY BY LEARNING TO USE APPROPRIATE HANDLING METHODS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A FOAL OR CALF, TRAIN THAT ANIMAL TO LEAD WITH THE USE OF A HALTER SO THAT THE ANIMAL WILL MOVE AND STOP AT THE DISCRETION OF THE STUDENT AND REMAIN CALM WHILE STANDING.
2. WHEN GIVEN A LAMB OR SHEEP, TRAIN THAT ANIMAL TO BE LED SO THAT THE ANIMAL WILL MOVE AND STOP AT THE DISCRETION OF THE STUDENT AND REMAIN CALM WHILE STANDING.
3. WHEN GIVEN A PIG AND A LIVESTOCK CANE OR PANEL, TRAIN THAT ANIMAL TO STOP AND GO WHERE THE STUDENT CHOOSES.
4. WHEN GIVEN A YOUNG CHICKEN, HOLD THAT ANIMAL SO AS NOT TO CAUSE UNDUE EXCITEMENT OR STRESS.
5. WHEN GIVEN A CERTAIN SPECIES OF LIVESTOCK, RESTRAIN THAT ANIMAL SO AS TO RENDER IT AS NEAR MOTIONLESS AS POSSIBLE WITH A MINIMUM OF EXCITEMENT AND/OR INJURY.

B. INSTRUCTIONAL AREAS

1. HALTERING LIVESTOCK
   - A. CATTLE
     - (1) DETERMINING PROPER SIZE AND KIND OF HALTER TO USE
     - (2) AGE WHEN BEST TO FIRST PUT ON HALTER
     - (3) TECHNIQUE OF PUTTING ON HALTER
   - B. HORSES

        (1) DETERMINING PROPER SIZE AND KIND OF HALTER TO USE
        (2) AGE WHEN BEST TO FIRST PUT ON HALTER
        (3) TECHNIQUE OF PUTTING ON HALTER

2. HALTER BREAKING LIVESTOCK

    A. METHODS OF HALTER BREAKING CATTLE

    B. METHODS OF HALTER BREAKING HORSES

3. TYING KNOTS FOR LEAVING A HALTERED ANIMAL UNATTENDED

    A. IMPORTANCE AND PURPOSE OF THIS KNOT

    B. PROCEDURE FOR TYING

4. DETERMINING THE AMOUNT OF CONTROL ONE HAS OVER A HALTERED ANIMAL

    A. RESTRAINING CAPACITY

    B. SIZE OF ANIMAL

    C. AIDS TO USE IN RESTRAINING ANIMALS WITH HALTERS

        (1) TWITCH
        (2) RING
        (3) NOSE LEAD
        (4) OTHER

5. TRAINING LIVESTOCK TO LEAD WITH HALTER

    A. CATTLE

    B. HORSES

6. CATCHING AND LEADING SHEEP

    A. METHODS OF CATCHING

    B. METHODS OF HOLDING

    C. METHODS OF MOVING OR LEADING SHEEP

[illegible] TRAINING SWINE TO GO AS DIRECTED

    A. USE OF CANE

    B. USE OF PANEL

8. HOLDING CHICKENS FOR OBSERVATION

A. CATCHING THE CHICKEN

(1) CAGE
(2) OPEN PEN

B. HOLDING CHICKEN FOR EXAMINATION

C. RETURNING TO CAGE

9. IDENTIFYING THE DIFFERENT PROCEDURES USED TO RESTRAIN LIVESTOCK

A. REASON FOR RESTRAINING LIVESTOCK

B. METHODS OF RESTRAINT

(1) HOBBLES
(2) SQUEEZE RESTRAINT
(3) FRONT LEG HOBBLES
(4) BEAM HOOK METHOD
(5) TRIMMING RACK
(6) CASTING
(7) LASSO
(8) OTHER METHODS

    (A) SHEEP
    (B) SWINE
    (C) HORSES
    (D) CATTLE

C. DETERMINING WHICH METHOD IS NEEDED

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. PROVIDE THE STUDENT WITH A ROPE AND HAVE HIM MAKE A ROPE HALTER WITH THE TEACHER'S INSTRUCTION AND SUPERVISION.

2. HAVE THE STUDENT PRACTICE CATCHING A SHEEP WITHOUT INJURING IT OR PUTTING IT UNDER UNDUE STRESS.

3. HAVE THE STUDENT PRACTICE USING A CANE TO DIRECT HOGS WITHIN CONFINED QUARTERS.

4. HAVE THE STUDENT PROPERLY CATCH A CHICKEN FROM A GROUP OF CHICKENS IN A LARGE PEN USING A LEG CATCHER WITHOUT CAUSING AN UNDUE AMOUNT OF EXCITEMENT.

5. HAVE THE STUDENT PRACTICE THROWING A CALF AND TYING ITS LEGS PROPERLY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. ASSIGN THE STUDENT A COLT OR CALF WITH WHICH HE HAS HAD LITTLE EXPERIENCE AND HAVE HIM TRAIN THAT ANIMAL TO LEAD AND OBEY HIS DEMANDS.

2. HAVE THE STUDENTS EXPLAIN WHAT PROCEDURES THEY WOULD USE IN MOVING A SHEEP AS FAR AS PROPER HAND POSITIONS ARE CONCERNED. THIS COULD BE IN THE FORM OF A PAPER AND PENCIL TEST OR AN ACTUAL PERFORMANCE EVALUATION.

3. ASK THE STUDENT TO EXPLAIN IN WRITING HIS PREFERENCE OF THE METHODS OF TRAINING SWINE TO MOVE AND REASONS FOR HIS PREFERENCE.

4. HAVE THE STUDENT DEMONSTRATE HIS ABILITY TO REMOVE A CHICKEN FROM A CAGE, EXAMINE AND RETURN THAT CHICKEN TO THE SAME CAGE WITHOUT CAUSING IT UNDUE EXCITEMENT OR INJURY.

5. ASK THE STUDENT TO EXPLAIN IN WRITING FIVE METHODS THAT MIGHT BE USED TO RESTRAIN LIVESTOCK AND SUGGEST WHICH METHOD HE WOULD PREFER TO USE UNDER CERTAIN CONDITIONS. AN EXAMPLE WHICH COULD BE USED WOULD BE AN APPROPRIATE METHOD FOR RESTRAINING A 450-POUND WEANLING BULL CALF WHEN BEING CASTRATED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. AVAILABILITY OF ANIMALS (PREFERABLY YOUNG)

2. ROPE AND LEATHER HALTERS FOR HORSES AND COWS

3. ROPE FOR MAKING HALTERS

4. CAGES FOR CHICKENS

5. HOBBLES

6. NOSE LEAD WITH ROPE

7. HOG SNARE

8. LARIAT

9. TWITCH

F. EXAMPLES OF SUPPORTING REFERENCES

1. BASIC CURRICULUM GUIDE FOR PRODUCTION AGRICULTURE - V.A. I. "HANDLING AND RESTRAINT OF ANIMALS," SECTION II B-1. COLLEGE STATION, TEXAS: AGRICULTURAL EDUCATION TEACHING MATERIALS CENTER, TEXAS A & M UNIVERSITY. PP. 1-5.

   THIS REFERENCE PROVIDES DISCUSSION ON THE TOPIC OF HANDLING AND RESTRAINING LIVESTOCK. IT ALSO PROVIDES ILLUSTRATIONS (NO. 1-7) SUITABLE FOR MAKING TRANSPARENCIES.

2. U.S. DEPARTMENT OF AGRICULTURE AND STATE EXTENSION SERVICES.

   BULLETINS ARE AVAILABLE FROM THESE SOURCES DEALING WITH HANDLING AND RESTRAINING LIVESTOCK. INDIVIDUAL STATES PUBLISH BULLETINS ON THIS TOPIC; PUBLICATION LISTS ARE USUALLY AVAILABLE ON REQUEST.

CASTRATING, DEHORNING, IDENTIFYING AND INJECTING LIVESTOCK

UNIT CONCEPT: AN ANIMAL BREEDER MUST KNOW HOW AND WHEN OR WHEN NOT TO CASTRATE, DEHORN AND INJECT HIS ANIMALS. HE MUST ALSO SEE TO IT THAT HE USES SOME MEANS OF IDENTIFICATION FOR EACH OF HIS LIVESTOCK. THESE MANAGEMENT PRACTICES ARE TO THE FARM AS THE IGNITION SYSTEM IS TO THE INTERNAL COMBUSTION ENGINE: WITHOUT THEM NEITHER WOULD OPERATE VERY SUCCESSFULLY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN AN ANIMAL OF A CERTAIN SPECIES, DETERMINE HOW BEST TO RESTRAIN THAT ANIMAL IN ORDER TO PERFORM THOSE MANAGEMENT PRACTICES APPROPRIATE FOR THAT PARTICULAR ANIMAL AS QUICKLY, PAINLESSLY AND SAFELY AS POSSIBLE.

2. WHEN GIVEN A PROPERLY RESTRAINED MALE ANIMAL, CASTRATE THAT ANIMAL BY THE MOST DESIRABLE PROCEDURE FOR THE GIVEN ENVIRONMENTAL CONDITIONS TO ASSURE THAT THE ANIMAL WILL NOT DEVELOP SECONDARY SEX CHARACTERISTICS.

3. WHEN GIVEN A PROPERLY RESTRAINED ANIMAL, DEHORN THAT ANIMAL BY THE MOST DESIRABLE PROCEDURE FOR THE GIVEN ENVIRONMENTAL CONDITIONS TO ASSURE THAT THE ANIMAL WILL NOT GROWN HORNS.

4. WHEN GIVEN A PROPERLY RESTRAINED ANIMAL WITH ONE OR BOTH HORNS OBSTRUCTING THEIR VISION OR ENDANGERING THEIR EYE(S), REMOVE ENOUGH OF THE HORN(S) TO CORRECT THE SITUATION.

5. WHEN GIVEN A PROPERLY RESTRAINED ANIMAL, APPLY THE MOST APPROPRIATE MEANS OF IDENTIFICATION ON THAT ANIMAL TO INSURE THAT IT HAS A PERMANENT MEANS OF IDENTIFICATION.

6. WHEN GIVEN A PROPERLY RESTRAINED ANIMAL, VACCINATE IT WITH THE APPROPRIATE VACCINE TO INSURE THAT IT HAS AN IMMUNITY TO A PARTICULAR PATHOGEN.

7. WHEN GIVEN A PROPERLY RESTRAINED ANIMAL THAT HAS JUST BEEN CASTRATED, GIVE THAT ANIMAL AN INTRAMUSCULAR INJECTION OF AN ANTIBIOTIC TO REDUCE THE CHANCES OF

INFECTION FROM THAT OPERATION.

8. WHEN GIVEN A DIAGRAM OF A CERTAIN SPECIES OF LIVESTOCK, EXPLAIN THE DIFFERENT TYPES OF INJECTIONS THAT MIGHT BE GIVEN AND SHOW ON THE DIAGRAM WHEN THEY MIGHT OR SHOULD BE GIVEN IN ORDER TO ACHIEVE THE MOST DESIRABLE EFFECT ON THE ANIMAL.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE BEST METHOD OF RESTRAINING ANIMAL FOR PURPOSES OF CASTRATION, DEHORNING AND INJECTING

   A. SIZE OF ANIMAL

   B. EQUIPMENT AVAILABLE

   C. METHOD OF RESTRAINT TO USE

2. CASTRATING FARM ANIMALS

   A. METHODS OF CASTRATION

      (1) KNIFE
      (2) BLOODLESS METHODS

         (A) ELASTRATOR
         (B) BURDIZZO CLAMPS

   B. DETERMINING WHICH METHOD TO USE

   C. AGE OF ANIMAL

   D. SANITATION PROCEDURES

   E. INSTRUMENTS USED

   F. TYPES OF SCROTAL INCISIONS

   G. EXPOSING THE TESTICLE

   H. REMOVING THE TESTICLE

   I. CLEAN-UP PROCEDURES FOR THE SCROTUM, DISINFECTANT, OBSERVATION
   J. PROCEDURES TO FOLLOW IF SCROTAL HERNIA IS PRESENT

   K. CAPONIZING POULTRY

      (1) RESTRAINING

- (2) TOOLS NEEDED
- (3) PROCEDURES USED
- (4) SANITATION PRECAUTIONS

3. DEHORNING FARM ANIMALS

A. ADVANTAGES OF DEHORNING

B. MOST DESIRABLE AGE TO DEHORN ANIMAL

C. METHODS OF DEHORNING

- (1) CHEMICAL DEHORNING
- (2) MECHANICAL DEHORNING
  - (A) HOT IRON
  - (B) SPOON AND TUBE
  - (C) ELASTRATOR
  - (D) BARNES-TYPE DEHORNER
  - (E) SAWS AND CLIPPERS

D. DETERMINING WHICH METHOD TO USE IN DEHORNING

E. PREVENTING EXCESSIVE BLEEDING

F. CARE OF ANIMAL AFTER DEHORNING

G. REMOVING END OF HORN OBSTRUCTING VISION OR ENDANGERING EYE

- (1) AMOUNT OF HORN TO REMOVE
- (2) METHOD OF REMOVING END OF HORN

4. METHODS OF IDENTIFYING LIVESTOCK USED ON THE FARM

A. IMPORTANCE OF ANIMAL IDENTIFICATION

B. METHODS OF PERMANENT IDENTIFICATION

- (1) BRANDING
  - (A) HOT IRON
  - (B) LIQUID BRANDING
  - (C) FREEZE BRANDING
- (2) MARKING ANIMALS
  - (A) EAR MARKS
    - 1. NOTCHING
    - 2. TATTOOING

  - (B) BRISKET NOTCHING
  - (C) BANDING

C. METHODS OF NONPERMANENT IDENTIFICATION

  - (1) NECK CHAINS AND TAGS
  - (2) EAR TAGS
  - (3) BRISKET TAG

D. DETERMINING WHICH METHOD(S) TO USE IN IDENTIFYING LIVESTOCK

5. IDENTIFYING THE INJECTION PROCEDURES USED ON LIVESTOCK

A. IMPORTANCE OF VACCINES, BACTERIAS AND SERUMS

B. METHODS OF GIVING INJECTIONS TO LIVESTOCK

  - (1) PARAEXTERNAL METHODS OF INJECTION
  - (2) CUTANEOUS
  - (3) INTRACUTANEOUS OR INTRADERMAL
  - (4) SUBCUTANEOUS
  - (5) INTRAVENOUS
  - (6) INTRAMUSCULAR
  - (7) INTRACARDIAL
  - (8) INTRATHORACIC
  - (9) INTRAOCULAR
  - (10) EPIDURAL
  - (11) INTRAPULMONARY

C. DETERMINING WHICH METHOD OF GIVING INJECTIONS IS APPROPRIATE FOR GIVEN SITUATIONS

D. PREPARING FOR GIVING INJECTIONS TO LIVESTOCK

E. TYPES OF SYRINGES AND NEEDLES

F. PARTS OF SYRINGES

G. FILLING THE SYRINGE PROPERLY

H. HANDLING BIOLOGICAL PRODUCTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. TAKE A FIELD TRIP TO A FARM WHERE PREVIOUS ARRANGEMENTS HAVE BEEN MADE TO CASTRATE, DEHORN, MARK, AND INNOCULATE AND VACCINATE CATTLE.

B. HAVE STUDENTS RESTRAIN ANIMALS WITH AND WITHOUT THE USE OF A SQUEEZE CHUTE.

2. HAVE THE STUDENTS CASTRATE THE MALE ANIMALS WITH KNIFE AND OTHER METHODS WITH AND WITHOUT USE OF A SQUEEZE CHUTE, IF AGREEABLE WITH THE COOPERATING FARMER.

3. THE STUDENT WILL DEHORN THOSE YOUNG CALVES WITH AN ELECTRIC DEHORNER AND OLDER ANIMALS WITH A SAW OR CLIPPER DEHORNER WITH THE AID OF THE SQUEEZE CHUTE.

4. HAVE STUDENTS REMOVE THE END OF A HORN THAT IS GROWING INTO THE EYE OF A MATURE SHEEP OR COW, IF THE OPPORTUNITY PRESENTS ITSELF.

5. HAVE STUDENTS TATTOO A PERMANENT NUMBER IN AN ANIMAL'S EAR AND ALSO PLACE AN EAR TAG OR BRAND ON ANIMALS.

6. HAVE STUDENTS VACCINATE CALVES FOR BLACKLEG OR OTHER DISEASES APPROPRIATE TO THE AREA.

7. HAVE THE STUDENTS GIVE EACH CASTRATED ANIMAL AN INTRAMUSCULAR INJECTION OF AN ANTIBIOTIC.

8. HAVE THE STUDENT MAKE A DIAGRAM SHOWING ALL THE DIFFERENT KINDS OF INJECTIONS FOR HIS NOTEBOOK.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENT DEMONSTRATE HIS ABILITY FOR THROWING AND RESTRAINING IN THE PROPER POSITION A BULL CALF TO BE CASTRATED. THE STUDENT MAY CHOOSE WHETHER HE WISHES ANOTHER STUDENT'S HELP OR TO USE A ROPE TO HOG-TIE THE CALF.

2. HAVE THE STUDENT DEMONSTRATE HIS ABILITY TO CASTRATE A YEARLING RAM WITH THE USE OF THE BURDIZZO CLAMPS. THE STUDENT MAY HAVE OTHER STUDENTS HELP IN RESTRAINING THE RAM.

3. THE STUDENT MAY BE EVALUATED ON HIS ABILITY TO DEHORN A YOUNG CALF WITH THE ELECTRIC DEHORNERS. THIS PROCESS SHOULD INVOLVE THE CLIPPING OF HAIR AROUND THE HORN BUTTON, RESTRAINING THE ANIMAL WITH AID OF OTHER STUDENTS EITHER BY THROWING OR SQUEEZE CHUTE, AND ACTUAL DEHORNING OF THE CALF WHICH SHOULD LEAVE A NEAT COPPER COLORED RING OF SEARED FLESH AROUND EACH BUTTON.

4. HAVE THE STUDENT REMOVE THE END OF A HORN THAT IS ENDANGERING THE EYE OF A MATURE COW. THIS PROCESS SHOULD BE PERFORMED ON THE ANIMAL RESTRAINED IN A SQUEEZE CHUTE OR SIMILAR APPARATUS BY MEANS OF A SAW.

5. THE STUDENT MAY BE EVALUATED ON HIS ABILITY TO TATTOO A PERMANENT IDENTIFICATION NUMBER IN THE EAR OF A BEEF ANIMAL. EMPHASIS SHOULD BE PLACED ON THE TATTOO BEING PROPERLY LOCATED IN AN UPRIGHT POSITION (NOT UPSIDE DOWN OR BACKWARDS) IN THE EAR. THE STUDENT SHOULD MAKE CERTAIN THE LETTERS AND/OR NUMBERS USED IN THE TATTOO ARE IN PROPER ORDER AND POSITION BY MAKING AN IMPRINT ON PAPER OR CARD BEFORE ACTUALLY USING IT ON THE ANIMAL.

6. HAVE THE STUDENT DEMONSTRATE HIS ABILITY TO VACCINATE A HOG AGAINST HOG CHOLERA. THE STUDENT SHOULD DEMONSTRATE HIS ABILITY TO PROPERLY FILL THE SYRINGE, SELECT THE MOST DESIRABLE NEEDLE SIZE TO USE, RESTRAIN THE ANIMAL WITH THE AID OF OTHER STUDENTS, AND USE THE RIGHT TYPE OF INJECTION DESCRIBED IN THE DIRECTIONS OF THE VACCINE ALONG WITH PROVIDING AN ACCURATE DOSE.

7. THE STUDENT SHOULD DEFINE ON AN ACTUAL ANIMAL THE REGIONS ON THE BODY WHERE AN INTRAMUSCULAR INJECTION MAY MOST DESIRABLY BE GIVEN.

8. HAVE THE STUDENT EXPLAIN WITH THE AID OF A FURNISHED DIAGRAM THE LOCATION AND PROCEDURES INVOLVED IN GIVING FIVE DIFFERENT TYPES OF INJECTIONS WHICH MAY BE ADMINISTERED TO LIVESTOCK.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. AVAILABILITY OF ANIMALS
2. AVAILABILITY OF SQUEEZE CHUTE AND CROWDING PENS
3. ROPES
4. BACTERIACIDE DISINFECTANT
5. SHARP KNIVES OR RAZORS
6. BURDIZZO CLAMPS
7. ELASTRATOR AND ELASTICS
8. CLEAN PENS AND PAILS
9. EMASCULATOR
10. ELECTRIC DEHORNER, BARNES-TYPE DEHORNER, SPOON OR TUBE-TYPE DEHORNER, SAWS, CLIPPER-TYPE DEHORNER, BLOOD COAGULATOR, FORCEPS TO PULL ARTERIES
11. ELECTRIC BRANDER, HOT IRON BRANDER

12. EAR NOTCHES, TATTOO SET, EAR TAGS, EAR TAG APPLICATOR

13. INJECTION PROCEDURE CHART, SYRINGE AND NEEDLE, COTTON, ALCOHOL, VACCINES, ANTIBIOTICS

F. EXAMPLES OF SUPPORTING REFERENCES

1. BASIC CURRICULUM GUIDE FOR PRODUCTION AGRICULTURE - V.A. I. "CASTRATING LIVESTOCK," SECTION II B-1; "DEHORNING," SECTION II B-3; "BRANDING, MARKING, EAR NOTCHING, TAGGING AND TATTOOING," SECTION II B-4; AND "INJECTION PROCEDURES," SECTION II B-6. COLLEGE STATION, TEXAS: AGRICULTURAL EDUCATION TEACHING MATERIALS CENTER, TEXAS A & M UNIVERSTIY. PP 1-4; 1-5; 1-5; AND 1-4.

   THE REFERENCES ABOVE PROVIDE INFORMATION ON THE TITLED TOPICS AS WELL AS ILLUSTRATIONS SUITABLE FOR MAKING TRANSPARENCIES (SEE ILLUSTRATIONS 1-3, 1-2, 1-3 AND 1-4, RESPECTIVELY).

2. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, 756 PAGES.

   THIS REFERENCE PROVIDES DISCUSSION ON THE TOPICS COVERED IN THIS UNIT (OTHER THAN INJECTION PROCEDURES) ALONG WITH ILLUSTRATIONS.

DOCKING, SHEARING, TRIMMING FEET AND WORMING SHEEP

UNIT CONCEPT: PRACTICES SUCH AS DOCKING TAILS, SHEARING, FOOT TRIMMING AND WORMING CONTRIBUTE TO BETTER HEALTH AND IMPROVED PRODUCTION OF SHEEP ENTERPRISES. THE SHEEP PRODUCER CAN INCREASE EFFECTIVENESS IN THESE PRACTICES BY KNOWING WHEN TO DO THEM AND THE PROPER PROCEDURES INVOLVED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A YOUNG LAMB, 1-2 WEEKS OLD, REMOVE THE TAIL (DOCK) FROM THAT ANIMAL IN A MANNER WHICH IS SANITARY, QUICK AND DOES NOT PUT THE LAMB UNDER UNDUE STRESS.
2. WHEN GIVEN A WOOLED SHEEP, SHEAR THAT SHEEP WITH THE USE OF AN ELECTRIC SHEARER IN A SYSTEMATIC PROCESS AS ILLUSTRATED BY THE SUNBEAM CORPORATION OR SIMILAR PROCEDURE.
3. WHEN GIVEN A SHEEP WHOSE FEET ARE IN NEED OF TRIMMING, TRIM THAT ANIMAL'S FEET BACK TO A NORMAL SHAPE SO THAT THE ANIMAL'S WEIGHT DISTRIBUTION IS EQUALLY DISPERSED OVER THE ENTIRE BOTTOM SURFACE OF ALL FOUR FEET.
4. WHEN GIVEN A YOUNG OR MATURE SHEEP THAT HAS BEEN DETERMINED TO BE IN NEED OF WORMING, WORM THAT ANIMAL WITH CORRECT DOSAGE AS INDICATED BY THE MANUFACTURER OR RESEARCH DATA WITHOUT INJURING THE ANIMAL.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE PROCESS OF DOCKING LAMBS
    - A. IMPORTANCE OF DOCKING
    - B. WHAT AGE TO DOCK
    - C. SANITATION OF TOOLS USED
    - D. RESTRAINING ANIMAL TO BE DOCKED
    - E. METHODS OF DOCKING
        - (1) KNIFE
        - (2) BURDIZZOS

        (3) EMASCULATOR
        (4) ELASTRATOR
        (5) HOT IRON AND MALLET

    F. TREATMENT AFTER DOCKING

2. IDENTIFYING THE PROCESS OF SHEARING SHEEP

    A. PURPOSES OF SHEARING SHEEP

        (1) ANIMAL HEALTH
        (2) ECONOMIC

    B. WHEN TO SHEAR SHEEP

    C. PARTIAL SHEARING OF SHEEP

        (1) TAGGING EWES
        (2) FACING (WOOL BLINDNESS)

    D. METHODS OF SHEARING SHEEP

        (1) HAND SHEARS
        (2) ELECTRIC SHEARS

    E. PROCEDURE OF SHEARING SHEEP

        (1) SUNBEAM CORPORATION ILLUSTRATIVE CHART
        (2) OTHER PROCEDURES

    F. ROLLING AND TYING WOOL

    G. PROPER STORAGE OF RAW WOOL

    H. METHODS OF SELLING WOOL

3. TRIMMING THE FEET OF SHEEP

    A. IMPORTANCE OF TRIMMING FEET

    B. EQUIPMENT NEEDED

    C. PROCEDURES USED IN TRIMMING FEET

    D. IDENTIFYING WHEN FOOT HAS BEEN PROPERLY TRIMMED

    E. DETERMINING HOW OFTEN TO TRIM SHEEP'S FEET DURING THE THE YEAR

4. IDENTIFYING THE MANAGEMENT PRACTICE OF WORMING SHEEP

A. TYPES OF WORMS THAT INFECT SHEEP

B. TYPES OF WORMING COMPOUNDS AVAILABLE

   (1) IMPORTANCE OF ROTATING WORMING COMPOUNDS
   (2) KNOWING WHAT COMPOUND TO USE TO INSURE CONTROL

C. IMPORTANCE OF SETTING UP DEFINITE SCHEDULE FOR WORMING SHEEP

D. EQUIPMENT NEEDED FOR WORMING SHEEP

E. PROCEDURES USED IN WORMING SHEEP

   (1) BOLUS
   (2) DRENCHING
   (3) ORAL
   (4) ADVANTAGES OF EACH OF THE ABOVE PROCEDURES
   (5) DISADVANTAGES OF EACH OF THE ABOVE PROCEDURES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS DOCK THE SMALL LAMBS WITH THE USE OF THE EMASCULATOR. HAVE ONE STUDENT HOLD THE LAMB AND ANOTHER PERFORM THE DOCKING PROCEDURE.

2. HAVE THE STUDENTS WORK IN PAIRS AND SHEAR A SHEEP ACCORDING TO THE SUNBEAM SHEEP SHEARING CHART.

3. HAVE EACH STUDENT PROPERLY TRIM THE FEET OF AT LEAST ONE SHEEP OR LAMB.

4. EACH OF THE STUDENTS SHOULD ADMINISTER A WORMING BOLUS OF THE PRESCRIBED DOSAGE TO AT LEAST ONE SHEEP WITH OR WITHOUT THE AID OF A BALLING GUN.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EVALUATE THE STUDENT ON HIS ABILITY TO DOCK A LAMB USING THE HOT CHISEL AND BLOCK OF WOOD. ALLOW ANOTHER STUDENT TO ASSIST IN RESTRAINING THE LAMB BEING DOCKED. THE LAMB SHOULD BE CHECKED FOR NEATNESS OF JOB DONE AND TO SEE IF PROPER SANITATION PRACTICES WERE USED DURING AND AFTER OPERATION.

2. EACH STUDENT SHOULD BE EVALUATED ON SHEARING SEVERAL SHEEP AND EMPHASIS SHOULD BE PLACED ON AMOUNT OF IMPROVEMENT MADE FROM THE FIRST SHEEP DONE TO THE LAST SHEEP SHEARED.

3. EACH STUDENT SHOULD BE EVALUATED ON THE JOB HE PERFORMS ON TRIMMING A SHEEP'S FEET. FINAL EVALUATION SHOULD BE BASED ON SUCH THINGS AS FINAL SHAPE OF THE FOOT, EVENNESS OF BOTTOM OF FOOT AND ABILITY OF STUDENT TO GET THE JOB DONE IN A REASONABLE AMOUNT OF TIME.

4. EVALUATE EACH STUDENT ON HIS ABILITY TO DRENCH A SHEEP WITH THE CORRECT DOSAGE OF DRENCH. MAJOR POINTS TO CONSIDER IN EVALUATION ARE PROPER INSERTION OF DRENCH GUN NOZZLE IN SHEEP'S MOUTH, ACCURACY IN GETTING PROPER AMOUNT OF DRENCH INTO SHEEP'S DIGESTIVE SYSTEM, AND THE ABILITY OF THE STUDENT TO GET THE JOB DONE WITHOUT UNDUE STRESS PUT ON SHEEP AND IN A REASONABLE AMOUNT OF TIME.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OVERHEAD PROJECTOR AND TRANSPARENCIES RELATED TO TOPIC
2. ILLUSTRATIVE CHARTS ON SHEARING SHEEP
3. EMASCULATOR
4. ELASTRATOR
5. DISINFECTANT
6. HOT WATER
7. SHALLOW PANS
8. ANTISEPTIC
9. SHEEP SHEARS (ELECTRIC)
10. CLEAN AREA TO SHEAR SHEEP OR CANVAS TO COVER OVER BEDDED AREA OF SHEEP BARN
11. SHEEP MARKING PAINT
12. WOOL BAGS
13. WOOL-TYING TWINE
14. SCALES
15. RECORD BOOK TO RECORD WOOL WEIGHTS
16. HOOF-TRIMMING SHEARS
17. HOOF-TRIMMING KNIVES (RIGHT AND LEFT-HANDED)

18. KEROSENE AND OIL MIXTURE FOR SHEARS' LUBRICATION
19. #10 TIN CANS FOR KEROSENE MIXTURE AND HOT WATER TO CLEAN AND LUBRICATE SHEARS
20. POP BOTTLES OR DRENCH GUN
21. WORMING BOLUSES OR DRENCH
22. BALLING GUN

F. EXAMPLES OF SUPPORTING REFERENCES

1. BASIC CURRICULUM GUIDE FOR PRODUCTION AGRICULTURE - V.A. I. "DOCKING SHEEP," SECTION II B-5. COLLEGE STATION, TEXAS: AGRICULTURAL EDUCATION TEACHING MATERIALS CENTER, TEXAS A & M UNIVERSITY. PP. 1-8.

   THIS REFERENCE PROVIDES ILLUSTRATIONS SUITABLE TO MAKE TRANSPARENCIES FROM ALONG WITH A DISCUSSION ON THE TOPIC OF DOCKING SHEEP.

2. SUNBEAM-STEWART SELF-TEACHING SHEARING CHART. CHICAGO, ILLINOIS: SUNBEAM OUTDOOR COMPANY.

   THIS CHART PROVIDES A STEP-BY-STEP PICTURE SEQUENCE OF HOW TO SHEAR A SHEEP.

3. U.S. DEPARTMENT OF AGRICULTURE AND STATE EXTENSION SERVICES.

   BULLETINS ARE AVAILABLE FROM THESE SOURCES DEALING WITH DOCKING, SHEARING, TRIMMING FEET AND WORMING SHEEP. LISTS OF PUBLICATIONS ARE AVAILABLE BY REQUEST.

PREPARING FOR SHOW AND SHOWING LIVESTOCK

UNIT CONCEPT: EACH SPECIES OF LIVESTOCK HAS CERTAIN CHARACTERISTICS WHICH DETERMINE HOW DESIRABLE THE ANIMAL IS TO POTENTIAL PURCHASERS. LIVESTOCK PRODUCERS CAN USE FITTING AND SHOWING TECHNIQUES TO ENHANCE THE ANIMAL'S VALUE BY EMPHASIZING THE DESIRED CHARACTERISTICS AND MINIMIZING ANY UNDESIRABLE CHARACTERISTICS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN AN ANIMAL OF A CERTAIN SPECIES AND THE PROPER EQUIPMENT, PREPARE THAT ANIMAL FOR SHOW IN A MANNER WHICH WILL MAXIMIZE ITS DESIRABLE CHARACTERISTICS AND MINIMIZE ITS UNDESIRABLE CHARACTERISTICS ACCORDING TO THE TYPE OF STANDARDS SET UP BY THE LIVESTOCK INDUSTRY.
2. WHEN GIVEN AN ANIMAL OF A CERTAIN SPECIES THAT HAS BEEN PREPARED FOR SHOW, SHOW THAT ANIMAL TO ITS BEST ADVANTAGE ACCORDING TO THE CUSTOMS AND STANDARDS ESTABLISHED BY THE LIVESTOCK INDUSTRY.

B. INSTRUCTIONAL AREAS

1. DETERMINING IN ADVANCE THE ANIMALS WHICH WILL BE PREPARED FOR SHOW REPRESENTING EACH LIVESTOCK SPECIES
    A. CLASS ELIGIBILITY
    B. AMOUNT OF TIME BEFORE SHOW
    C. BEST PHENOTYPE SELECTION
2. IDENTIFYING THE PROCESSES INVOLVED IN PREPARING EACH LIVESTOCK SPECIES FOR SHOW
    A. GROOMING TECHNIQUES
    B. WASHING TECHNIQUES
    C. CLIPPING OR SHEARING TECHNIQUES

D. TRIMMING FEET

E. FEEDING PRACTICES

(1) MARKET ANIMAL
(2) BREEDING ANIMAL

F. TRAINING ANIMALS TO LEAD OR GO AS DIRECTED

G. TRAINING ANIMALS TO STAND PROPERLY

H. TRAINING ANIMALS TO BE HANDLED BY JUDGE

I. TRAINING ANIMALS TO BECOME USED TO CROWDS AND THEIR NOISES

3. DETERMINING THE TECHNIQUES USED IN SHOWING EACH LIVESTOCK SPECIES IN THE SHOW RING

A. KNOWING BACKGROUND INFORMATION ON THE ANIMAL

B. POSITIONING THE ANIMAL

C. SHOWING THE ANIMAL TO BEST ADVANTAGE

D. WHO TO PAY ATTENTION TO IN THE SHOW RING

E. TECHNIQUES TO USE ON AN ANIMAL WHILE JUDGE IS HANDLING OR OBSERVING

F. GOOD SHOW RING MANNERS

G. POOR SHOW RING MANNERS

H. OTHER TECHNIQUES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE EACH STUDENT PREPARE AN ANIMAL FOR SHOW WITH WHICH HE IS NOT FAMILIAR. IF THIS CAN BE USED AS A 4-H PROJECT ALONG WITH A VOCATIONAL AGRICULTURE ASSIGNMENT, THIS IS FINE.

2. SET UP A VOCATIONAL AGRICULTURE LIVESTOCK SHOW AND CALL IT THE "LITTLE INTERNATIONAL" OR SOME SIMILAR NAME.

ARRANGE FOR EACH STUDENT TO COMPETE IN THIS SHOW WITH THE ANIMAL HE HAS PREPARED FOR THIS CONTEST. HAVE THE STUDENT ARRANGE FOR THE DETAILS, JUDGES, SHOW RING CONSTRUCTION, RIBBONS AND SO ON. INVITE THE PUBLIC, ALONG WITH PARENTS, TO THIS CONTEST.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EACH STUDENT SHOULD BE EVALUATED ON THE JOB HE DOES IN PREPARING HIS ANIMAL FOR SHOW. THOSE STUDENTS WHO, FOR SOME REASON, DO NOT HAVE ANIMALS ASSIGNED TO THEM SHOULD BE EVALUATED ON THE JOB THEY DO IN SETTING UP THE LIVESTOCK SHOW.

2. THE STUDENT SHOULD BE EVALUATED ON THE EFFORT HE PUTS INTO THE SHOWING OF HIS ANIMAL. THIS SHOULD NOT MEAN THE WINNERS OF EACH CLASS GET A'S, SECOND PLACE B'S. EACH STUDENT SHOULD BE EVALUATED CONSIDERING THE AMOUNT OF WORK HE PUT INTO HIS ANIMAL PLUS THE AMOUNT OF PROGRESS HE MADE IN LEARNING FROM BEGINNING TO END.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OVERHEAD PROJECTOR AND TRANSPARENCY MATERIALS
2. ELECTRIC CLIPPERS AND SHEEP SHEARS
3. HAND SHEEP SHEARS
4. SCISSORS
5. GROOMING BRUSHES
6. SHEEP GROOMING TABLE WITH YOKE
7. WOOL CARDS
8. SHOW HALTER (BEEF, DAIRY AND HORSES)
9. CURLERS FOR BEEF
10. COMBS
11. MILD LIQUID DISHWASHING SOAP (NON-DETERGENT)
12. MILD DETERGENT
13. BUCKETS
14. HOSES

15. OLD ROPE HALTERS TO USE ON LIVESTOCK WHILE WASHING
16. ROPE OR SNOWFENCE AND FENCE POSTS TO MAKE JUDGING RING IF OUTSIDE
17. RIBBONS FOR CONTESTANTS
18. APPROPRIATE TROPHY FOR PREMIER SHOWMAN IN EACH CLASS OF LIVESTOCK
19. APPROPRIATE TROPHY FOR PREMIER SHOWMAN IN ALL CLASSES OF LIVESTOCK
20. FOOT TRIMMING EQUIPMENT
21. LIVESTOCK BLANKETS
22. SHOVELS
23. WHEEL BARROWS
24. RAKES
25. CLEAN RAGS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. THE STOCKMAN'S HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, PP. 617-635.

   THIS REFERENCE PROVIDES A CHAPTER ON FITTING AND SHOWING OF BEEF, SHEEP AND SWINE. ILLUSTRATIONS ARE INCLUDED ALONG WITH THE WRITTEN MATERIAL.

2. FITTING AND SHOWING BEEF CATTLE. COLUMBIA, MISSOURI: INSTRUCTIONAL MATERIALS LABORATORY, UNIVERSITY OF MISSOURI. PP. 175-181.

   THIS REFERENCE PROVIDES INFORMATION AND TRANSPARENCIES ON FITTING AND SHOWING BEEF CATTLE.

THE PROCESSES INVOLVED IN MILKING COWS

UNIT CONCEPT: PROFITS FROM DAIRY PRODUCTION DEPEND CONSIDERABLY UPON FACTORS SUCH AS LOW LABOR PER 1,000 POUNDS OF MILK, HIGH MILK PRODUCTION PER COW, HEALTH OF MAMMARY SYSTEM, AND CLEAN QUALITY MILK. THE DAIRYMAN CAN GREATLY INFLUENCE THESE FACTORS BY THE TYPE OF MILKING PROCEDURES WHICH ARE USED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE EQUIPMENT USED IN MILKING OF DAIRY COWS IN ITS BETWEEN-MILKING STATE, ASSEMBLE AND SANITIZE THAT EQUIPMENT TO INSURE THE PROPER AND SANITARY MILKING OF THE DAIRY HERD.

2. WHEN GIVEN A LACTATING DAIRY ANIMAL, THROUGHLY WASH WITH A SANITIZING AGENT AND MASSAGE THE UDDER AND TEATS IN ORDER TO INITIATE THE MILK LET DOWN EFFECT AND CLEANSE THE AREA SO SANITARY MILKING MAY BE ACCOMPLISHED.

3. WHEN GIVEN A LACTATING DAIRY ANIMAL, INITIATE MILK FLOW FROM EACH QUARTER THROUGH THE SIEVE OF A STRIP CUP IN ORDER TO CHECK THAT ANIMAL'S MILK FOR MASTITIS AND TO REMOVE THE FIRST PRODUCED MILK FROM THE MAMMARY SYSTEM WHICH HAS A HIGHER INCIDENCE OF BACTERIAL CONTAMINATION.

4. WHEN GIVEN A MILKING MACHINE JUST PRIOR TO PUTTING IT ON A COW, DIP THE TEAT CUPS INTO A SANITIZING AGENT BEFORE PUTTING THAT MACHINE ON THE COW IN ORDER TO REDUCE THE CHANCES OF PASSING ANY BACTERIAL INFECTION FROM ONE COW TO ANOTHER.

5. WHEN GIVEN A LACTATING DAIRY ANIMAL THAT HAS BEEN PREPARED FOR MILKING, PUT THE MILKING MACHINE ON THAT ANIMAL WITHOUT SUCKING FOREIGN MATERIAL INTO THE TEAT CUPS, LOSING THE VACUUM OR CAUSING UNDUE EXCITEMENT TO THE COW.

6. WHEN GIVEN A LACTATING DAIRY ANIMAL WITH A MILKING MACHINE ON, DETERMINE WHEN THE ANIMAL IS COMPLETELY MILKED OUT AND REMOVE THE MACHINE IN THE PROPER MANNER BEFORE INTERNAL INJURY IS CAUSED TO THE UDDER SECRETORY TISSUE AS DETERMINED BY AN INSTRUCTOR OR DAIRYMAN.

7. WHEN GIVEN A LACTATING DAIRY ANIMAL THAT HAS BEEN COMPLETELY MILKED OUT, TREAT THAT ANIMAL'S TEATS WITH A

MILD ANTISEPTIC TO DECREASE THE CHANCES OF MAMMARY INFECTION.

8. WHEN GIVEN A HEIFER THAT JUST FRESHENED, TRAIN THAT ANIMAL TO BE MILKED BY MACHINE WITHOUT CAUSING HER UNDUE STRESS AND EXCITEMENT.

9. WHEN GIVEN THE MILKING UNIT(S) (BUCKET-TYPE MACHINE, PIPELINE SYSTEM OR EMPTY BULK TANK) IN NEED OF CLEANING AFTER THE COMPLETION OF MILKING, PROPERLY DISMANTLE, PRE-RINSE, WASH, RINSE, SANITIZE AND DRAIN THAT UNIT SO AS TO BE COMPLETELY FREE OF RESIDUE AND SANITIZED WITH PROPER CHEMICALS ACCORDING TO THE LABEL.

B. INSTRUCTIONAL AREAS

1. PREPARING THE MILKING UNIT(S) FOR MILKING

   A. ASSEMBLING

   B. SANITIZING

   C. CEHCKING VACUUM UNIT

   D. PREPARING BULK TANK FOR RECEPTION OF MILK

2. PREPARING THE SANITIZING AGENTS TO BE USED WHILE MILKING

   A. WASH FOR UDDER AND TEATS

   B. TEAT DIP

   C. TEAT CUP DIP

3. PREPARING A DAIRY COW FOR MILKING

   A. WASHING UDDER AND TEATS WITH WARM WATER AND SANITIZING AGENT

      (1) PROPER TIME
      (2) PURPOSES

   B. CHECKING EACH QUARTER FOR MASTITIS

      (1) STRIP CUP USE
      (2) IDENTIFICATION OF MASTITIS
      (3) OTHER FUNCTION SERVED BY USE OF STRIP CUP

4. DETERMINING THE PROPER TECHNIQUE OF PUTTING THE MILKING MACHINE ON THE COW

- A. SANITIZING THE TEAT CUPS
- B. ACTIVATION OF MILKING MACHINE
- C. ATTACHING UNIT TO PIPELINE SYSTEM
- D. ATTACHING UNIT TO COW OR POSITIONING UNIT ON FLOOR NEXT TO COW
- E. APPLYING TEAT CUPS TO TEATS
    - (1) POSITION OF TEAT CUPS IN HAND
    - (2) PREVENTING LOSS OF VACUUM
    - (3) PREVENTING FOREIGN MATERIALS BEING SUCKED INTO SYSTEM
    - (4) RECHECKING FOR PROPER MACHINE APPLICATION
    - (5) ADJUSTING THE MACHINE FOR MOST RAPID MILKING

5. IDENTIFYING WHEN THE COW IS COMPLETELY MILKED OUT
    - A. DISADVANTAGES OF UNDER MILKING
    - B. DANGERS OF MILKING MACHINE BEING LEFT ON TOO LONG
    - C. TECHNIQUES FOR DETERMINING WHEN THE COW IS MILKED OUT
    - D. TECHNIQUE OF MACHINE STRIPPING
    - E. PROPERLY REMOVING THE TEAT CUPS
    - F. ADMINISTERING TEAT DIP
    - G. TREATING SWOLLEN UDDER AND/OR CRACKED TEATS
6. TRAINING THE FRESH HEIFER TO THE MILKING MACHINE
    - A. USE OF HOBBLES
    - B. WORDS OF ENCOURAGEMENT
    - C. PUTTING THE TEAT CUPS ON TEATS
    - D. METHODS OF CALMING
    - E. LENGTH OF TIME TO LEAVE MACHINE ON
    - F. TREATMENT OF SORE TEATS AND SWOLLEN UDDER
7. WASHING MILKING UNITS AFTER MILKING IS COMPLETED
    - A. RINSING ENTIRE UNIT

B. DISMANTLING

C. WASHING AND SCRUBBING OF MACHINE BUCKETS

D. CHANGING PIPELINE SYSTEM FOR SELF-CLEANING

E. USE OF PROPER CLEANING AGENTS

F. RINSING AND PROPER DRYING OF MILK BUCKETS

G. PROPER CONNECTION OF HOSES AND TEAT CUPS TO SELF-WASH ASSEMBLY

H. PROPER CARE AND STORAGE OF PULSATORS

I. IMPORTANCE OF VACUUM SYSTEM TO MILK PRODUCTION

J. PROPER WASHING, RINSING AND SANITIZING OF EMPTY BULK TANK

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENT PREPARE A PIPELINE SYSTEM SUCH AS IS FOUND IN A MILKING PARLOR FOR USE. CARE SHOULD BE TAKEN THAT ALL PIPES ARE LOCATED WHERE THEY SHOULD BE AND THAT THE TERMINATION OF PIPELINE IS THE BULK TANK.

2. HAVE THE STUDENTS WASH AND MASSAGE THE UDDER AND TEATS OF MILK COWS AT APPROXIMATELY ONE MINUTE BEFORE THE MILKING MACHINE WILL BE PUT ON.

3. HAVE THE STUDENT PRACTICE USING THE STRIP CUP TO CHECK EACH QUARTER FOR MASTITIS PRIOR TO MILKING THE COW.

4. HAVE THE STUDENT PUT THE MILKING MACHINE ON A COW THAT HAS BEEN PROPERLY PREPARED FOR MILKING.

5. HAVE THE STUDENT LEARN THE TECHNIQUE OF MACHINE STRIPPING A COW. ALONG WITH THIS, HE SHOULD BE TRAINED TO RECOGNIZE BY FEEL OF THE UDDER AND FLOW OF MILK THROUGH FEEDER PIPE WHEN THE COW IS COMPLETELY MILKED OUT SO THAT HE MAY REMOVE THE MACHINE BEFORE INJURY TO THE SECRETORY TISSUE OCCURS.

6. HAVE THE STUDENT USE A TEAT DIP ON EACH TEAT AFTER THE COW HAS BEEN MILKED.

7. HAVE THE STUDENT DIP THE TEAT CUPS OF THE MILKING MACHINE IN A SANITIZING AGENT BEFORE MILKING EACH COW.

8. HAVE THE STUDENT PUT HOBBLES ON THE JUST-FRESH HEIFER

IN PREPARATION FOR MILKING FOR THE FIRST TIME.

9. AFTER MILKING IS COMPLETED, HAVE THE STUDENT WASH THE BUCKET-TYPE MILKER WITH SCRUB BRUSH, HOT WATER AND CLEANER. PROVIDE A BLACK LIGHT FOR THE STUDENT TO CHECK THE BUCKET FOR MILK STONE DEPOSITS. (BLACK LIGHT BEAM WILL ILLUMINATE MILK STONE DEPOSITS.)

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO PUT A BUCKET-TYPE MILKING MACHINE TOGETHER AND SANITIZE IT PROPERLY IN PREPARATION FOR MILKING.

2. HAVE THE STUDENT EXPLAIN IN WRITING WHAT PHYSIOLOGICAL CHANGES THAT TAKE PLACE IN THE COW AS A RESULT OF WASHING AND MASSAGING THE UDDER AND TEAT ONE MINUTE PRIOR TO MILKING.

3. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO USE THE STRIP CUP FOR CHECKING EACH QUARTER PRIOR TO MILKING. THE EVALUATOR SHOULD MAKE SURE THAT A MINIMUM OF TWO OR THREE STREAMS OF MILK FROM EACH QUARTER ARE RUN THROUGH THE SIEVE OF THE STRIP CUP AND CHECKED FOR MASTITIS.

4. HAVE THE STUDENT DEMONSTRATE HIS ABILITY TO PUT A MILKING MACHINE ON A PROPERLY PREPARED MILK COW AS QUICKLY AND QUIETLY AS POSSIBLE.

5. HAVE THE STUDENT DEMONSTRATE HIS ABILITY TO DETERMINE WHEN THE COW HAS BEEN COMPLETELY MILKED OUT BY FEELING AND WORKING THE UDDER AND USE OF THE MACHINE STRIP PROCESS.

6. HAVE THE STUDENT EXPLAIN IN WRITING WHAT THE ADVANTAGES ARE OF USING A TEAT DIP ON A COW AFTER SHE HAS BEEN MILKED.

7. HAVE EACH STUDENT EXPLAIN IN WRITING WHY IT IS IMPORTANT TO DIP THE TEAT CUPS IN A SANITIZING AGENT PRIOR TO PUTTING ON EACH COW.

8. HAVE THE STUDENT DEMONSTRATE THREE PROCEDURES WHICH MIGHT BE INCORPORATED IN "BREAKING IN" A FRESH HEIFER TO THE MILKING PROCESS.

9. EVALUATE THE STUDENT ON HIS ABILITY TO WASH A BULK TANK AFTER THE MILK HAS BEEN REMOVED. CLOSE CHECK SHOULD BE MADE PARTICULARLY IN HARD-TO-GET-AT AREAS. INSTRUCTOR CAN USE A BLACK LIGHT WHICH WILL ILLUMINATE MILK STONE DEPOSITS ON THE SURFACE OF MILK BUCKET OR BULK TANK.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OVERHEAD PROJECTOR AND TRANSPARENCIES ON THE SUBJECT
2. AVAILABILITY OF DAIRY FARM WITH MILKING PARLOR
3. AVAILABILITY OF DAIRY FARM WITH PIPELINE COMFORT STALL SET UP
4. BUCKET-TYPE MILKING MACHINE
5. PAPER TOWELS
6. BUCKET
7. TEAT DIP
8. STRIP CUP
9. DISINFECTANT
10. HOBBLES
11. SCRUB BRUSHES (SMALL)
12. BULK TANK SCRUB BRUSH (LARGE)
13. CLEANING SOAPS
14. PIPELINE CLEANER - SANITIZERS
15. HOSE
16. BLACK LIGHT

F. EXAMPLES OF SUPPORTING REFERENCES

1. ENSMINGER, M. E. ANIMAL SCIENCE. 6TH EDITION. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1961, PP. 581-598.

   THIS STUDENT REFERENCE PROVIDES A CHAPTER ON MILK SECRETION AND HANDLING ALONG WITH ILLUSTRATIONS ON THAT TOPIC.

2. FOLEY, RICHARD C., BATH, DONALD L., DICKINSON, FRANK W. AND TUCKER, ALLEN H. DAIRY CATTLE: PRINCIPLES, PRACTICES, PROBLEMS, PROFITS. PHILADELPHIA, PENNSYLVANIA: LEA AND FEBIGER. 1972.

   THIS IS A COMPREHENSIVE TEXT ABOUT DAIRY CATTLE PRODUCTION INCLUDING INFORMATION ON MILKING MANAGEMENT OF COWS.

III

PLANT SCIENCE

U.S.O.E. CODE 01.01. 02 00 00

THE FUNCTIONS OF TILLAGE FOR SEED GERMINATION AND PLANT GROWTH

SOIL PROPERTIES AS RELATED TO TILLAGE PRACTICES

TILLAGE EQUIPMENT COSTS AND LABOR EFFICIENCY

SELECTION OF A TILLAGE SYSTEM

PLANTING EQUIPMENT SELECTION

PLANTING EQUIPMENT CALIBRATION

PLANTING PROCEDURES AND PROCESSES

NUTRIENT NEEDS OF FARM CROPS

DETERMINING FERTILITY NEEDS

SELECTION AND APPLICATION OF LIME AND FERTILIZER

METHODS OF FERTILIZER APPLICATION AND PLACEMENT

EFFECTS OF FERTILIZER CHEMICALS ON THE ECOLOGY

COMBINING FERTILIZERS WITH PESTICIDES

CONTROLLING WEEDS IN FARM CROPS

CONTROLLING DISEASES IN FARM CROPS

CONTROLLING INSECTS IN FARM CROPS

SAFE USE OF PEST CONTROL CHEMICALS

HARVESTING FARM CROPS

DRYING FARM CROPS

PLANT SCIENCE (CONTINUED)

HANDLING AND STORAGE OF FARM CROPS

MARKET PRICE TRENDS AND CYCLES IN CROP MARKETING, SUPPLY AND DEMAND

SELECTING FARM CROP MARKETING OUTLETS

GRADING FARM CROPS

RANGE PLANT ECOLOGY

RANGE PLANT IDENTIFICATION

RANGE CONDITION, TREND AND UTILIZATION

RANGE GRAZING MANAGEMENT

RANGE RENOVATION PRACTICES

THE FUNCTIONS OF TILLAGE FOR SEED GERMINATION AND PLANT GROWTH

UNIT CONCEPT: SUCCESSFUL CROP PRODUCTION IS DETERMINED BY MANY FACTORS AND SEVERAL ARE ASSOCIATED WITH SOIL TILLAGE. THE IMPORTANT FACTORS ASSOCIATED WITH TILLAGE ARE SEED GERMINATION, PLANTING TIME, WATER ABSORPTION AND RETENTION, PEST CONTROL AND SOIL COMPACTION. THE CROP PRODUCER WILL NEED TO DETERMINE THE FUNCTIONS OF SOIL TILLAGE IN RELATION TO HOW IT AFFECTS THESE FACTORS IN ORDER TO SECURE HIGH YIELDS ECONOMICALLY AND EFFICIENTLY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR A GIVEN SOIL TYPE, SOIL CONDITION AND CROP SEED, SELECT THE TILLAGE PRACTICES THAT WILL PRODUCE SOIL CONDITIONS PROVIDING 90% OR MORE GERMINATION OF VIABLE SEED.

2. FOR A GIVEN SOIL TYPE AND SOIL CONDITION, SELECT THE TILLAGE PRACTICES THAT INCREASE AND DECREASE THE SOIL MOISTURE BASED ON DATA FROM TILLAGE RESEARCH STUDIES.

3. WHEN GIVEN THE PROBABLE PESTS (WEEDS, INSECTS, DISEASES, RODENTS, BIRDS) THAT MAY DAMAGE A CROP, SELECT THOSE TILLAGE PRACTICES THAT INCREASE OR DECREASE PEST PROBLEMS ACCORDING TO THE LATEST AGRONOMIC AND PEST CONTROL INFORMATION.

4. USING INFORMATION REGARDING THE STRUCTURAL CHARACTERISTICS OF THE SOIL WHERE A CROP IS TO BE GROWN, SELECT TILLAGE PRACTICES THAT DO NOT CAUSE EXCESSIVE SOIL COMPACTION ACCORDING TO THE LATEST TILLAGE RESEARCH DATA.

B. INSTRUCTIONAL AREAS

1. DETERMINING SOIL CONDITIONS IN THE SEED GERMINATION ZONE OF THE SOIL

    A. DETERMINING FINENESS OF SOIL PARTICLES

    B. DETERMINING AMOUNT OF MOISTURE NEEDED

    C. DETERMINING EXTENT SOIL CRUSTING AFFECTS SEED GERMINATION

2. DETERMINING SOIL CONDITIONS AND THEIR RELATIONSHIP TO WATER ABSORPTION AND RETENTION

   A. DETERMINING TEXTURE OF THE SOIL

      (1) FIELD EXAMINATION
      (2) SOIL INFORMATION MAP OF FARM

   B. RATING SOIL TEXTURES AS TO WATER ABSORPTION AND RETENTION

   C. DETERMINING SOIL SURFACE CONDITIONS THAT INCREASE WATER ABSORPTION

      (1) CROP RESIDUES AND OTHER MULCH MATERIALS
      (2) PHYSICAL CONDITION OF SOIL SURFACE

   D. DETERMINING SLOPE OF THE FIELD

3. EVALUATING TILLAGE PRACTICES REGARDING WATER ABSORPTION AND RETENTION

   A. COMPARING SURFACE CONDITIONS OF SOIL

   B. COMPARING AMOUNT OF RESIDUE ON SOIL SURFACES

   C. COMPARING ROOT ZONE CONDITIONS OF THE SOIL

4. DETERMINING PROBABLE PESTS THAT MAY INVADE A CROP PRODUCTION FIELD

   A. DETERMINING PREVIOUS PROBLEMS OF THE FIELD

   B. DETERMINING TILLAGE PRACTICES THAT MAY INCREASE OR DECREASE PEST PROBLEMS

5. DETERMINING SOIL STRUCTURE OF THE FIELD

6. COMPARING TILLAGE PRACTICES THAT INCREASE SOIL COMPACTION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS VISIT FARMS OR AGRICULTURAL RESEARCH CENTERS WHERE COMPARISONS OF SOIL CONDITIONS AND CROP GROWTH CHARACTERISTICS FROM THE USE OF DIFFERENT TILLAGE PRACTICES CAN BE OBSERVED.

   B. VIEW SLIDES OF SOIL AND CROP GROWTH CONDITIONS SHOWING THE RESULT OF THE USE OF DIFFERENT TILLAGE PRACTICES.

C. HAVE STUDENTS PREPARE A DESCRIPTIVE LIST OF SOIL CONDITIONS OBTAINED FROM THE USE OF DIFFERENT TILLAGE IMPLEMENTS: ONE COLUMN BEING THE NAME OF THE TILLAGE IMPLEMENT; AND THE SECOND COLUMN BEING A DESCRIPTION OF THE PROBABLE SOIL CONDITIONS, BOTH SEED AND ROOT ZONE, AND THE EXTENT OF CROP RESIDUE WHICH IS LEFT ON THE SOIL SURFACE FROM IMPLEMENT USE.

2. HAVE STUDENTS PREPARE A FACT SHEET OF WATER RUN-OFF AND WATER ABSORPTION FROM SOILS WITH DIFFERENT SLOPES AND TEXTURES.

3. HAVE STUDENTS SELECT THE MOST PROBABLE DAMAGING PESTS FOR THEIR CROP PRODUCTION FIELDS AND LIST THE TILLAGE PRACTICES THAT MAY INCREASE OR DECREASE THE PEST PROBLEM.

4. HAVE STUDENTS MAKE A COMPARISON CHART: ONE COLUMN, THE TILLAGE PRACTICES; AND THE SECOND COLUMN, A RATING OF THE TILLAGE PRACTICE AS TO THE PROBABLE AMOUNT OF COMPACTION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING-TYPE TEST FOR STUDENTS TO RATE TILLAGE PRACTICES FOR PREPARATION OF THE SOIL IN THE SEED ZONE: ONE COLUMN, THE TILLAGE PRACTICE TO BE USED; AND THE SECOND COLUMN, A RATING SCALE. HAVE STUDENTS COMPLETE THE RATING SCALE.

2. PROVIDE STUDENTS WITH A LIST OF DIFFERENT SLOPES AND SOIL TEXTURE DESCRIPTIONS. AFTER EACH DESCRIPTION, HAVE THEM DESCRIBE THE TILLAGE PRACTICE OR PRACTICES THAT PROVIDE THE BEST CONDITION FOR WATER ABSORPTION AND RETENTION.

3. PROVIDE STUDENTS WITH SPECIFIC PEST PROBLEM SITUATIONS AND HAVE THEM LIST THE TILLAGE PRACTICE THAT WILL BEST CONTROL THE PROBLEM.

4. PROVIDE STUDENTS WITH SEVERAL SOIL STRUCTURE CHARACTERISTICS AND HAVE THEM LIST THE TILLAGE PRACTICE THAT WILL CAUSE THE LEAST SOIL COMPACTION FOR EACH SITUATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUAL AIDS SHOWING SOIL CONDITIONS IN THE SEED AND ROOT ZONE FROM THE USE OF DIFFERENT TILLAGE SYSTEMS. EXAMPLES ARE: (1) TILLAGE SYSTEMS FOR CORN; (2) SOIL AND ITS PROPERTIES; (3) KNOW YOUR LAND (SLIDE SERIES AVAILABLE FROM OHIO AGRICULTURAL

EDUCATION CURRICULUM MATERIALS SERVICE); AND (4) TILLAGE FOR PROFIT (NORTH DAKOTA EXTENSION SERVICE).

2. SLIDES, PICTURES OR OTHER VISUAL AIDS SHOWING THE ACTION IN THE SOIL MADE BY TILLAGE IMPLEMENTS

3. FARM SOIL SURVEY MAPS

4. SOIL SAMPLES OR SOIL PROFILE MOUNTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ALDRICH, SAMUEL ROY AND LENG, EARL R. MODERN CORN PRODUCTION. CINCINNATI, OHIO: F AND W PUBLISHING COMPANY. 1966, 308 PAGES.

   THIS REFERENCE CONTAINS DETAILED INFORMATION ON ALL PHASES OF CORN PLANT NUTRITION AND USING FERTILIZER.

2. FRIDLINE, CLARENCE R. TILLAGE SYSTEMS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1973, 55 PAGES.

   THIS MANUAL PROVIDES BASIC INFORMATION ON SOIL PROPERTIES AND DESCRIBES THE SOIL CONDITIONS OBTAINED FROM DIFFERENT TILLAGE PRACTICES. IT ALSO PROVIDES INFORMATION ON THE RELATIONSHIP OF TILLAGE PRACTICES TO PEST CONTROL.

3. MINIMUM TILLAGE. VAS 4041. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1970, 8 PAGES.

   THIS REFERENCE UNIT OUTLINES ADVANTAGES AND DISADVANTAGES OF MINIMUM TILLAGE, MINIMUM TILLAGE METHODS AND PROCEDURES FOR MINIMUM TILLAGE.

SOIL PROPERTIES AS RELATED TO TILLAGE PRACTICES

UNIT CONCEPT: A SPECIFIC TILLAGE PRACTICE DOES NOT USUALLY PRODUCE THE SAME RESULTS ON ALL SOIL TYPES. CROP PRODUCERS SHOULD BE FAMILIAR WITH THE PHYSICAL PROPERTIES OF THE SOILS THEY TILL, AND HAVE A KNOWLEDGE OF THE RESULTS OBTAINED FROM USING DIFFERENT TILLAGE SYSTEMS. THEY CAN THEN SELECT THE TILLAGE PRACTICES TO USE FOR THEIR SOIL SITUATIONS AND BY SO DOING SHOULD BE ABLE TO PRODUCE CROPS MORE ECONOMICALLY AND EFFICIENTLY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN INFORMATION REGARDING THE PHYSICAL PROPERTIES OF DIFFERENT SOIL TYPES, AND THE NAMES OF THE SOIL TYPES OF THEIR FARMS, DETERMINE THE PHYSICAL PROPERTIES OF THE SOILS TO BE USED FOR CROP PRODUCTION AND SELECT THE BEST TILLAGE PRACTICES BASED UPON TILLAGE RESEARCH DATA TO THE SATISFACTION OF THE TEACHER.

2. WHEN GIVEN INFORMATION REGARDING THE PHYSICAL PROPERTIES OF THE SOIL, THE CROP TO BE GROWN, DETERMINE THE TILLAGE PRACTICES TO USE, BASED ON YIELD AND EFFECTS ON THE SOIL, ACCORDING TO TILLAGE RESEARCH INFORMATION AND TO THE SATISFACTION OF THE TEACHER.

B. INSTRUCTIONAL AREAS

1. INTERPRETING SOIL MAPS
    A. LOCATING AND LISTING SOIL MAP SYMBOLS (NUMBERS AND LETTERS)
    B. DETERMINING SOIL NAMES
2. DETERMINING AND ANALYZING PROPERTIES OF SPECIFIC SOIL TYPES
    A. DETERMINING AVAILABLE MOISTURE IN THE CROP ROOT ZONE
    B. EVALUATING THE NATURAL DRAINAGE

C. CALCULATING THE SLOPE IN PERCENTAGE

D. CALCULATING THE ORGANIC MATTER PERCENTAGE

3. ANALYZING TILLAGE PRACTICES AS TO THEIR EFFECT ON THE SOIL

A. SELECTING TILLAGE PRACTICES THAT REDUCE SOIL EROSION

B. SELECTING TILLAGE PRACTICES THAT MAINTAIN SOIL STRUCTURE AND REDUCE COMPACTION

4. COMPARING YIELD DATA FROM TILLAGE RESEARCH STUDIES

A. SELECTION OF TILLAGE PRACTICES FROM RESEARCH DATA ON SOIL TYPES THE SAME OR VERY SIMILAR TO THOSE OF THE STUDENTS' CROP PRODUCTION FIELDS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USING THE SOIL MAPS OF THEIR FARMS, HAVE STUDENTS PREPARE A LIST OF THE SOIL TYPES FOR EACH OF THEIR CROP PRODUCTION FIELDS.

B. USING INFORMATION REGARDING THE PHYSICAL PROPERTIES OF SOIL TYPES, HAVE STUDENTS LIST THE PHYSICAL PROPERTIES THAT DESCRIBE THE SOIL TYPES OF THEIR CROP PRODUCTION FIELDS.

2. USING INFORMATION FROM TILLAGE RESEARCH STUDIES ON SOILS HAVING PHYSICAL PROPERTIES THE SAME OR VERY SIMILAR TO THOSE OF THE STUDENTS, HAVE THEM SELECT THOSE TILLAGE PRACTICES THAT SHOW HIGHEST AND LEAST HARM TO THE SOIL.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH A SOIL MAP OF A FARM AND A REFERENCE GIVING SOIL PHYSICAL PROPERTIES DESCRIPTIONS. HAVE THEM PREPARE A DESCRIPTION CHART. USE ONE COLUMN FOR THE NAMES OF THE SOIL TYPES, THE SECOND COLUMN FOR A DESCRIPTION OF THE PHYSICAL PROPERTIES OF EACH OF THE SOIL TYPES. EVALUATE ON THE BASIS OF COMPLETENESS AND ACCURACY OF THE DESCRIPTIONS.

2. DEVELOP A MATCHING TEST, ONE COLUMN BEING THE SOIL TYPE NAMES AND A DESCRIPTION OF THE PHYSICAL PROPERTIES OF EACH, AND THE SECOND COLUMN A LIST OF TILLAGE PRACTICES THAT WOULD BE USED. HAVE STUDENTS MATCH THE TILLAGE PRACTICES BEST FOR THE SOIL TYPES. RATING OF THE TILLAGE PRACTICES WOULD BE BASED ON YIELDS OBTAINED AND EFFECTS ON THE SOIL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SOIL DESCRIPTION MAPS

2. COLOR SLIDES, PICTURES OR OTHER VISUALS SHOWING SOIL CONDITIONS FROM USE OF DIFFERENT TILLAGE PRACTICES

3. RESEARCH DATA TABLES OF TILLAGE PRACTICES THAT SHOW YIELDS AND ADVERSE EFFECTS ON THE SOIL, SUCH AS EROSION

4. SOIL AND ITS PROPERTIES, SLIDE SERIES. COLUMBUS,OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY.

F. EXAMPLES OF SUPPORTING REFERENCES

1. FRIDLINE, CLARENCE R. TILLAGE SYSTEMS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1974, 55 PAGES.

   THIS MANUAL PROVIDES INFORMATION ON PROCEDURES TO FOLLOW IN MATCHING INFORMATION REGARDING PHYSICAL PROPERTIES OF SOILS TO THE SOIL TYPE.

2. STATE AGRONOMY GUIDES. STATE EXTENSION SERVICES.

   THESE GUIDES FROM MANY STATES GIVE PERTINENT INFORMATION REGARDING TILLAGE RESEARCH THAT HAS BEEN CONDUCTED; ALSO, INFORMATION REGARDING THE PHYSICAL PROPERTIES OF THE SOIL TYPES OF THE STATE.

TILLAGE EQUIPMENT COSTS AND LABOR EFFICIENCY

UNIT CONCEPT: TILLAGE EQUIPMENT VARIES CONSIDERABLY IN THE TIME REQUIRED TO TILL AN AREA, THE COSTS AND THE EFFECT ON THE SOIL SO THAT PROPER SELECTION OF TILLAGE EQUIPMENT IS AN IMPORTANT FACTOR IN CROP YIELDS AND THE PROFIT FROM CROP PRODUCTION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN INFORMATION REGARDING KIND AND SIZE OF TILLAGE IMPLEMENTS, DETERMINE THE TIME REQUIRED TO TILL AN ACRE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS AND RESEARCH DATA FROM FARM MANAGEMENT STUDIES.

2. USING INFORMATION PROVIDING THE OPTIMUM PLANTING DATES FOR A CROP, DETERMINE THE TILLAGE PRACTICES THAT CAN BE ACCOMPLISHED IN THE TIME AVAILABLE UNDER NORMAL WEATHER CONDITIONS ACCORDING TO WEATHER AND IMPLEMENT TIME-USE DATA.

3. WHEN GIVEN SIZE OF TILLAGE IMPLEMENT, DETERMINE THE SIZE OF THE TRACTOR TO USE ACCORDING TO THE SPECIFICATIONS FOR THE IMPLEMENT AND REALISTIC TO SOIL TYPES IN THE LOCAL AREA.

4. WHEN PRESENTED WITH INFORMATION REGARDING SIZE OF TILLAGE IMPLEMENT, SIZE OF TRACTOR REQUIRED, COSTS AND TIME REQUIRED TO USE, CALCULATE THE COST OF IMPLEMENT USE PER ACRE BASED ON DATA OF FARM MANAGEMENT STUDIES.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE TIME REQUIRED TO USE TILLAGE IMPLEMENTS
   - A. SELECTING IMPLEMENT SIZE
   - B. CALCULATING TIME REQUIRED PER ACRE
2. DETERMINING BEST PLANTING DATES FOR CROPS
   - A. REVIEWING RESEARCH DATA ON DIFFERENT PLANTING DATES
   - B. CALCULATING LOSSES CAUSED BY LATE PLANTING DATES

3. BUDGETING TIME AVAILABLE FOR TILLAGE
    A. CALCULATING THE TIME AVAILABLE FOR TILLAGE BASED ON WEATHER DATA
    B. ESTIMATING TIME REQUIRED FOR OTHER FARM WORK
    C. COMPARING TIME REQUIRED FOR USING DIFFERENT TILLAGE PRACTICES
4. DETERMINING TRACTOR SIZE FOR IMPLEMENT USE
    A. DETERMINING KIND AND SIZE OF TILLAGE IMPLEMENT
    B. DETERMINING TRACTOR TYPE TO USE
        (1) DIESEL
        (2) GASOLINE
5. CALCULATING IMPLEMENT COSTS PER ACRE FOR USE
    A. CALCULATING INITIAL COSTS AND USEFUL LIFE OF IMPLEMENTS, INCLUDING TRACTOR
    B. DETERMINING REPAIR AND LUBRICATION COSTS
    C. DETERMINING TRACTOR FUEL COSTS
        (1) SIZE OF TRACTOR
        (2) FUEL TYPE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS INVENTORY TILLAGE IMPLEMENTS AVAILABLE FOR USE, INVENTORY TO INCLUDE SIZE AND PRESENT VALUE.

    B. HAVE STUDENTS PREPARE A TILLAGE TIME USING AN INFORMATION CHART: ONE COLUMN, THE KIND OF IMPLEMENT; A SECOND COLUMN, THE SIZE OF IMPLEMENT; AND A THIRD COLUMN, HOURS OR FRACTION OF AN HOUR REQUIRED PER ACRE FOR USE.

2. A. USING RESEARCH DATA SHOWING YIELD RETURNS, HAVE STUDENTS DETERMINE THE BEST PLANTING DATES FOR THE CROPS THEY PLAN TO PRODUCE.

    B. HAVE STUDENTS DECIDE THE OPTIMUM DATES TO PLANT THEIR CROPS AND ATTAINABLE YIELD GOALS; THEN HAVE THEM CALCULATE PROBABLE YIELD LOSSES FROM DELAYED PLANTING DATES.

C. HAVE STUDENTS PREPARE A TIME BUDGET OF FARM JOBS DURING THE SEASON WHEN SOIL TILLAGE WILL NEED TO BE DONE, INCLUDING THE TIME FOR TILLAGE.

3. HAVE STUDENTS PREPARE A TRACTOR SIZE REQUIREMENT CHART: ONE COLUMN, THE KIND AND SIZE OF TILLAGE IMPLEMENT; AND THE SECOND COLUMN, THE TRACTOR SIZE REQUIREMENT (PTO-HP).

4. USING SPECIFIC TILLAGE IMPLEMENTS WITH THE TRACTOR SIZE (PTO-HP) GIVEN, HAVE STUDENTS MAKE COMPARISON OF COSTS PER ACRE, 10 ACRES OR 100 ACRES, TO USE EACH IMPLEMENT FOR SOIL TAILLAGE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE STUDENTS A LIST OF TILLAGE IMPLEMENTS COMPARABLE IN SIZE AND A RATING SCALE FOR TIME REQUIRED PER ACRE. HAVE EACH STUDENT AFFIX A RATING FOR EACH IMPLEMENT.

2. A. PROVIDE STUDENTS WITH A LIST OF POSSIBLE PLANTING DATES FOR A CROP, THE YIELD GOAL AND PERCENT LOSSES FOR DELAYED PLANTING DATES. HAVE EACH STUDENT INDICATE THE OPTIMUM PLANTING DATES AND CALCULATE THE YIELD LOSSES FOR THE DELAYED PLANTING DATES.

   B. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING TIME AVAILABLE FOR SOIL TILLAGE BEFORE THE OPTIMUM PLANTING DATE OF A CROP AND THE CROP ACRES TO BE PLANTED. HAVE EACH STUDENT LIST THE TILLAGE PRACTICES THEY WOULD USE IN THE TIME AVAILABLE.

3. DEVELOP A MATCHING TEST FOR STUDENTS' USE: ONE COLUMN, THE KIND AND SIZE OF THE TILLAGE IMPLEMENT; AND THE SECOND COLUMN, THE TRACTOR SIZE (PTO-HP).

4. PROVIDE STUDENTS WITH INFORMATION REGARDING A SPECIFIED NUMBER OF TILLAGE IMPLEMENTS - KIND, SIZE, TIME REQUIRED PER ACRE, COST PER ACRE, TRACTOR SIZE, FUEL TYPE AND COST PER HOUR TO USE. SPECIFY ACRES FOR CROP PRODUCTION AND HAVE STUDENTS CALCULATE COSTS TO USE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. IMPLEMENT TIME-USE CHARTS

2. IMPLEMENT COST CHARTS

3. MECHANICAL CALCULATOR

F. EXAMPLES OF SUPPORTING REFERENCES

1. FRIDLINE, CLARENCE R. TILLAGE SYSTEMS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1974, 55 PAGES.

   THIS MANUAL PROVIDES SPECIFIC INFORMATION IN DETERMINING TIME REQUIRED FOR TILLAGE IMPLEMENT USE, DETERMINING TRACTOR SIZE AND CALCULATING TRACTOR AND IMPLEMENT COSTS.

SELECTION OF A TILLAGE SYSTEM

UNIT CONCEPT: SEVERAL FACTORS NEED TO BE CONSIDERED IN SELECTING A TILLAGE SYSTEM. MORE THAN ONE TILLAGE SYSTEM MAY NEED TO BE SELECTED IN ORDER TO ALLOW FOR DIFFERENCES IN THE PHYSICAL PROPERTIES OF SOILS AND THE TIME AND COSTS INVOLVED. ANY TILLAGE SYSTEM SELECTED SHOULD PROVIDE FOR FLEXIBILITY TO ALLOW FOR ADVERSE WEATHER CONDITIONS, IN ORDER THAT THE OPTIMUM PLANTING DATE OF A CROP IS NOT DELAYED. CONSIDERATION SHOULD BE GIVEN TO THE AMOUNT OF WATER RETENTION, SOIL EROSION AND SOIL COMPACTION THAT OCCURS FROM USING DIFFERENT TILLAGE SYSTEMS. THE CROP PRODUCER SHOULD SELECT A TILLAGE SYSTEM THAT WILL PRODUCE THE HIGHEST YIELDS WITH THE LEAST IMPLEMENT COSTS, AND THE LEAST DAMAGE TO THE SOIL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN SPECIFIC INFORMATION REGARDING THE PHYSICAL PROPERTIES OF SOIL TYPES, SELECT A TILLAGE SYSTEM THAT WILL PRODUCE THE HIGHEST YIELDS ACCORDING TO RESULTS SHOWN BY THE LATEST RECOGNIZED AGRONOMIC RESEARCH DATA.

2. WHEN GIVEN INFORMATION ABOUT THE SIZE AND TYPE OF IMPLEMENTS USED IN A TILLAGE SYSTEM, DETERMINE THE TIME AND COSTS REQUIRED TO USE EACH SYSTEM ACCORDING TO THE LATEST AGRONOMY AND FARM MANAGEMENT RESEARCH DATA FOR THE AREA.

3. WHEN GIVEN INFORMATION REGARDING THE IMPLEMENTS USED AND THE SOIL TYPES ON WHICH THE SYSTEMS WERE USED FOR VARIOUS TILLAGE SYSTEMS, DETERMINE THE AMOUNT OF SOIL EROSION AND SOIL COMPACTION PRODUCED BY EACH SYSTEM ACCORDING TO THE LATEST AGRONOMY RESEARCH DATA FOR THE AREA.

4. WHEN PRESENTED WITH SITUATIONS REGARDING A LIMITED AMOUNT OF TIME AVAILABLE DUE TO ADVERSE WEATHER OR OTHER FACTORS IN PERFORMING THE PLANNED TILLAGE OPERATIONS, SELECT ALTERNATE TILLAGE PRACTICES TO PROVIDE FLEXIBILITY IN THE TILLAGE SYSTEM IN ORDER TO REACH THE OPTIMUM PLANTING DATES ACCORDING TO THE LATEST RECOMMENDATIONS OF AGRONOMY SPECIALISTS.

B. INSTRUCTIONAL AREAS

1. INTERPRETING TILLAGE SYSTEMS RESEARCH DATA

   A. SELECTING RESEARCH DATA APPLICABLE TO THE SOIL PROPERTIES OF HOME FARM

   B. COMPARING YIELD RESULTS FROM DIFFERENT TILLAGE SYSTEMS

2. DETERMINING TIME AND COSTS FOR TILLAGE SYSTEMS

   A. DETERMINING KIND OF IMPLEMENTS USED FOR EACH SYSTEM

   B. CALCULATING TIME REQUIRED TO USE EACH IMPLEMENT

   C. DETERMINING SIZE OF TRACTOR TO USE FOR EACH IMPLEMENT

   D. CALCULATING IMPLEMENT COSTS, INCLUDING TRACTOR COSTS

3. COMPARING TIME AND COSTS FOR DIFFERENT TILLAGE SYSTEMS

4. DETERMINING EFFECTS ON THE SOIL CAUSED BY DIFFERENT TILLAGE SYSTEMS

   A. COMPARING SOIL LOSS BY EROSION

   B. ESTIMATING AMOUNT OF SOIL COMPACTION

5. DETERMINING ALTERNATIVES (FLEXIBILITY) IN A PLANNED TILLAGE SYSTEM

   A. SELECTING IMPLEMENTS REQUIRING LEAST TIME TO USE

   B. COMPARING SOIL CONDITION PRODUCED BY EACH IMPLEMENT

      (1) WET SOILS
      (2) RESIDUE COVERAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS MAKE A DIAGRAM OF THE FIELDS TO BE USED FOR CROP PRODUCTION OF THEIR HOME FARMS, ASSIGNING A NUMBER TO EACH FIELD. THEN HAVE THE STUDENTS PREPARE AN ACCOMPANYING INFORMATION SHEET LISTING THE SOIL PROPERTIES OF EACH FIELD ACCORDING TO THE NUMBER ASSIGNED. HAVE THEM LIST THE TILLAGE SYSTEMS APPLICABLE TO EACH FIELD BASED ON YEILD RESULTS.

2. HAVE STUDENTS PREPARE AN IMPLEMENT COST AND TIME INFORMATION SHEET, DIVIDING THE SHEET INTO FOUR COLUMNS.

ONE COLUMN SHOULD BE USED FOR THE KIND AND SIZE OF IMPLEMENT AND TRACTOR. A SECOND COLUMN CAN BE FOR THE TIME REQUIRED PER ACRE TO USE EACH IMPLEMENT. A THIRD COLUMN CAN BE FOR THE COST TO USE THE IMPLEMENT, INCLUDING TRACTOR. A FOURTH COLUMN IS FOR THE TIME AND COSTS REQUIRED TO USE EACH TILLAGE SYSTEM WHICH WOULD BE COMBINATIONS OF IMPLEMENT USED FOR EACH TILLAGE SYSTEM SELECTED.

3. HAVE STUDENT PREPARE A RATING OF TILLAGE SYSTEMS REGARDING THE AMOUNT OF SOIL EROSION AND COMPACTION.

4. USING INFORMATION REGARDING THE SOIL PROPERTIES OF THE HOME FARMS, HAVE STUDENTS SELECT TILLAGE SYSTEM INVOLVING THE LEAST AMOUNT OF TIME. HAVE THEM RATE EACH SYSTEM AS TO SUITABILITY FOR USING WITH CURRENT CONDITIONS ON THE HOME FARM SUCH AS AVAILABLE EQUIPMENT AND RESOURCES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A LIST OF MATCHING ITEMS: ONE COLUMN BEING THE SOIL PROPERTIES OF SELECTED SOIL TYPES, AND THE SECOND COLUMN BEING SELECTED TILLAGE SYSTEM. HAVE STUDENTS COMPLETE THE MATCHING TEST BASED ON YIELD RESULTS.

2. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING IMPLEMENTS USED FOR TWO, THREE OR MORE TILLAGE SYSTEMS. HAVE THEM CALCULATE TIME AND COSTS REQUIRED TO USE EACH SYSTEM.

3. PROVIDE STUDENTS WITH A LIST OF TILLAGE SYSTEMS, INCLUDING TIME AND NUMBER OF TRIPS REQUIRED OVER THE FIELD. HAVE STUDENTS RATE THE SYSTEMS ON TWO FACTORS - AMOUNT OF SOIL EROSION AND SOIL COMPACTION.

4. WITH A SPECIFIC SITUATION REGARDING TIME AVAILABLE AND NUMBER OF ACRES TO BE TILLED, HAVE STUDENTS SELECT ONE OR MORE SYSTEMS THAT WILL MEET THE PROBLEM SITUATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUALS OF SOIL PROPERTIES OF SOIL TYPES

2. CHARTS PROVIDING INFORMATION REGARDING TIME AND COSTS FOR IMPLEMENT USE

3. RESEARCH DATA CHARTS PROVIDING INFORMATION ON SOIL EROSION AND SOIL COMPACTION CAUSED BY TILLAGE IMPLEMENTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. FRIDLINE, CLARENCE R. TILLAGE SYSTEMS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1974, 55 PAGES.

   THIS REFERENCE PROVIDES SPECIFIC INFORMATION REGARDING THE CALCULATION OF TIME AND COSTS FOR TILLAGE IMPLEMENTS. INFORMATION REGARDING SOIL EROSION AND SOIL COMPACTION IS ALSO PROVIDED.

2. STATE AGRONOMY GUIDES, STATE EXTENSION SERVICE.

   MANY STATE EXTENSION SERVICES PUBLISH ANNUALLY OR BIANNUALLY AGRONOMY GUIDES AND MANY OF THESE GUIDES SUPPLY INFORMATION REGARDING THE PHYSICAL PROPERTIES OF SOIL TYPES. YIELD RESULTS AND OTHER DATA REGARDING TILLAGE SYSTEMS RESEARCH IS ALSO PROVIDED IN MANY OF THE GUIDES.

3. TILLAGE SYSTEMS RESEARCH DATA.

   MANY STATE RESEARCH CENTERS OR STATE EXTENSION SERVICES PUBLISH RESULTS OF RESEARCH REGARDING TILLAGE SYSTEMS. THIS MATERIAL MAY BE EITHER MIMEOGRAPH PUBLICATIONS OR PRINTED BULLETINS.

PLANTING EQUIPMENT SELECTION

UNIT CONCEPT: THE SELECTION OF PLANTING EQUIPMENT TO USE SHOULD BE DETERMINED BY THE PHYSICAL PROPERTIES OF THE SOIL, TILLAGE PRACTICE TO BE USED, NUMBER OF ACRES TO BE PLANTED AND THE CROPS TO BE GROWN. KEEPING THESE FACTORS IN MIND IN SELECTING PLANTING EQUIPMENT SHOULD ASSIST IN PROVIDING ECONOMY AND EFFICIENCY IN PRODUCING CROPS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION REGARDING THE KIND OF CROPS TO BE GROWN AND ACREAGES OF EACH, DETERMINE THE KIND AND SIZE OF PLANTING EQUIPMENT TO SELECT ACCORDING TO RECOGNIZED APPROVED DATA REGARDING COSTS AND TIME USE, AND RECOMMENDATIONS OF AGRONOMY AND FARM EQUIPMENT SPECIALISTS.

2. WHEN PROVIDED WITH INFORMATION REGARDING THE PHYSICAL PROPERTIES OF THE SOILS AND TILLAGE PRACTICES PLANNED, DETERMINE THE TYPE OF EQUIPMENT TO SELECT ACCORDING TO RECOGNIZED APPROVED TILLAGE RESEARCH DATA AND RECOMMENDATIONS OF EQUIPMENT MANUFACTURERS AND AGRONOMY SPECIALISTS.

B. INSTRUCTIONAL AREAS

1. DETERMINING SIZE OF PLANTING EQUIPMENT TO SELECT
    - A. DETERMINING TIME REQUIRED TO DO PLANTING JOBS FOR CROPS TO BE GROWN
    - B. COMPARING TIME INVOLVED USING DIFFERENT SIZES OF PLANTING EQUIPMENT
    - C. COMPARING COSTS INVOLVED IN USING DIFFERENT SIZES OF PLANTING EQUIPMENT
2. DETERMINING KIND OF EQUIPMENT TO SELECT
    - A. DETERMINING ACRES OF EACH CROP TO BE PLANTED
    - B. COMPARING COSTS OF DIFFERENT KINDS OF EQUIPMENT
    - C. COMPARING COSTS OF OWNING AND RENTING EQUIPMENT

D. COMPARING QUALITY OF PLANTING PERFORMED BY DIFFERENT KINDS OF EQUIPMENT

3. COMPARING FUNCTIONS AND COSTS ACCOMPLISHED BY TYPES OF EQUIPMENT

   A. DETERMINING FUNCTIONS AND COSTS OF NO-TILLAGE PLANTING EQUIPMENT

      (1) COULTER TYPE
      (2) CHISEL TYPE

   B. COMPARING COSTS AND PERFORMANCES OF TYPES OF DRILLING AND BROADCASTING PLANTING EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. FROM A LIST OF KINDS OF PLANTING EQUIPMENT AVAILABLE AND THE CROPS TO BE PRODUCED, HAVE STUDENTS SELECT FROM THE LIST THE PLANTING EQUIPMENT THEY WOULD NEED TO OWN.

   B. USING A SELECTED NUMBER OF ACRES FOR PRODUCTION OF CROPS, HAVE STUDENTS PREPARE COST AND TIME COMPARISONS FOR USING DIFFERENT SIZE PLANTING EQUIPMENT.

2. A. VIEW SLIDES, PICTURES OR OBSERVE UNDER ACTUAL FIELD CONDITIONS THE TYPES OF PLANTING EQUIPMENT UNDER EACH GENERAL KIND.

   B. FROM DESCRIPTIONS OF TYPES OF EQUIPMENT, HAVE STUDENTS SELECT THOSE TYPES MOST SUITABLE FOR THEIR CROP PLANTING SITUATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING ACREAGES OF CROPS TO BE GROWN ON A FARM, HAVE THEM DETERMINE, BASED ON PLANTING EQUIPMENT DESCRIPTIONS INCLUDING COSTS AND TIME INVOLVED, THE EQUIPMENT KIND AND SIZE THEY WOULD SELECT.

2. USING A MATCHING-TYPE TEST WITH ONE COLUMN BEING DESCRIPTIONS OF PHYSICAL PROPERTIES OF SOILS AND/OR TILLAGE PRACTICES USED AND THE OTHER COLUMN BEING DESCRIPTIONS OF TYPES OF PLANTING EQUIPMENT, HAVE STUDENTS ARRANGE ACCORDING TO THE MOST SUITABLE SELECTIONS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUALS OF PLANTING EQUIPMENT
2. SAMPLES OR SOIL PROFILE MOUNTS OF SOIL TYPES
3. TIME USE AND COST CHARTS OF PLANTING EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. NARROW ROW EQUIPMENT FOR CORN AND SOYBEANS. A E 68. LAFAYETTE, INDIANA: AGRICULTURAL PUBLICATIONS, PURDUE UNIVERSITY. 1968, 27 PAGES.

   THIS IS A GENERAL DISCUSSION OF TYPES OF NARROW ROW EQUIPMENT WHICH INCLUDES GENERAL DESCRIPTIONS AND COMPARISONS OF EACH TYPE OF EQUIPMENT.

2. THE PLANTER - SELECTION, ADJUSTMENT, MAINTENANCE AND USE. VAS 3021. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1967, 40 PAGES.

   THIS REFERENCE GIVES INFORMATION REGARDING FACTORS TO CONSIDER IN SELECTION OF KIND AND TYPE OF PLANTS.

PLANTING EQUIPMENT CALIBRATION

UNIT CONCEPT: THE CROP PRODUCER MUST BE ABLE TO CHECK AND ADJUST, IF NEEDED, ALL PLANTING EQUIPMENT HE USES, FOLLOWING RECOMMENDED PROCEDURES, IN ORDER TO APPLY THE CORRECT AMOUNT OF SEED PER ACRE TO PROVIDE ECONOMY AND EFFICIENCY IN HIS PLANTING PRACTICES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH EQUIPMENT USED FOR PLANTING SEEDS IN ROWS, AND SEEDS OF A CROP WITH A SPECIFIED SPACING IN THE ROW, CHECK THE SEED SPACING AND ADJUST, IF NEEDED, TO ATTAIN THE CORRECT SPACING ACCORDING TO SPECIFICATIONS OF THE PLANTING EQUIPMENT MANUFACTURER.

2. WHEN PROVIDED WITH EQUIPMENT USED FOR DRILLING OR BROADCASTING SEEDS, AND THE SEEDS OF A CROP WITH A SPECIFIED AMOUNT TO BE PLANTED PER ACRE, CHECK AND ADJUST THE EQUIPMENT, IF NEEDED, TO OBTAIN THE CORRECT AMOUNT OF SEED PLANTED PER ACRE WITH 95% ACCURACY, ACCORDING TO RECOMMENDATIONS OF THE EQUIPMENT MANUFACTURER.

B. INSTRUCTIONAL AREAS

1. CALIBRATING EQUIPMENT DESIGNED FOR SEED SPACING IN THE ROW

    A. DETERMINING SEED SPACING TO USE

        (1) CROP TO BE GROWN
        (2) SOIL FERTILITY
        (3) PLANNED YIELD GOAL
        (4) GERMINATION PERCENTAGE OF SEED

    B. MATCHING SEED SIZE TO SEED PLATE SIZE OR SEED ORIFICE SIZE

    C. DETERMINING SPEED TO TRAVEL WHILE PLANTING

    D. CHECKING THE PLANTING RATE USING SURFACE METHOD OF PLANTING

  - (1) ADJUSTING THE PLANTER FOR SEED SPACING DESIRED
  - (2) MEASURING THE SEED SPACING FROM THE SURFACE PLANTING
  - (3) MAKING EQUIPMENT ADJUSTMENTS, IF NEEDED

E. CHECKING THE PLANTING RATE WITH PLANTING EQUIPMENT IN A FIXED POSITION

  - (1) CALCULATING REVOLUTIONS OF DRIVE WHEELS REQUIRED FOR A SELECTED DISTANCE
  - (2) ADJUSTING EQUIPMENT FOR DESIRED SEED SPACING
  - (3) COUNTING NUMBER OF SEEDS DISCHARGED
  - (4) CALCULATION OF SEED SPACING FROM NUMBER OF SEEDS DISCHARGED AND NUMBER OF REVOLUTIONS OF DRIVE WHEEL (PLANTING DISTANCE)
  - (5) MAKING EQUIPMENT ADJUSTMENTS IF NEEDED

2. CALIBRATING EQUIPMENT DESIGNED FOR DRILL ROW OR BROADCASTING APPLICATIONS OF SEEDS

A. DETERMINING THE AMOUNT TO BE APPLIED PER ACRE

  - (1) CROP SEED TO BE USED
  - (2) GERMINATION PERCENTAGE OF SEED

B. ADJUSTING THE EQUIPMENT FOR CROP SEED TO BE USED

C. CALCULATING THE NUMBER OF REVOLUTIONS THE DRIVE WHEEL SHOULD BE TURNED FOR A SELECTED DISTANCE

D. MEASURING THE QUANTITY OF SEED DISCHARGED

E. MAKING EQUIPMENT ADJUSTMENTS, IF NEEDED

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS CALCULATE THE SEED SPACING THAT SHOULD BE USED FOR A SPECIFIED CROP BASED ON THE SOIL FERTILITY, YIELD GOAL AND GERMINATION PERCENTAGE OF THE SEED TO BE USED.

B. PROVIDE STUDENTS WITH SEVERAL SEED PLATES AND SOME SEED AND HAVE THEM PRACTICE SELECTING THE SEED PLATE TO USE, OR IF THE PLANTING EQUIPMENT IS THE PLATELESS TYPE, HAVE THEM PRACTICE SELECTING THE SEED ORIFICE TO USE.

C. USING THE SCHOOL FARM MECHANICS SHOP OR THE FACILITIES OF AN EQUIPMENT DEALER, HAVE STUDENTS PRACTICE ADJUSTING PLANTING EQUIPMENT FOR DIFFERENT SEED ROW SPACING DISTANCES.

D. HAVE STUDENTS MOVE PLANTING EQUIPMENT FOR A SPECIFIED DISTANCE AND MEASURE THE SEED SPACING OBTAINED.

E. HAVE STUDENTS PRACTICE CALCULATING FROM THE MEASUREMENT OF THE CIRCUMFERENCE OF THE DRIVE WHEEL, THE NUMBER OF REVOLUTIONS NEEDED FOR SPECIFIED DISTANCES.

F. HAVE STUDENTS DETERMINE WHAT EFFECT ON SEED DROP ACCURACY WILL OCCUR BY MOVING THE DRIVE WHEEL AT DIFFERENT SPEEDS.

G. HAVE STUDENTS PRACTICE MAKING ADJUSTMENTS IN PLANTING EQUIPMENT TO OBTAIN THE DESIRED SEED SPACING.

2. A. USING REFERENCES THAT PROVIDE INFORMATION ON SEEDING RATES FOR CROPS, HAVE STUDENTS SELECT THOSE APPLICABLE TO THEIR SITUATIONS.

B. USING DRILLING AND BROADCASTING EQUIPMENT HAVE STUDENTS PRACTICE MAKING ADJUSTMENTS FOR SPECIFIED RATES OF PLANTING IN BUSHELS AND POUNDS.

C. USING DRILLING AND BROADCASTING EQUIPMENT HAVE STUDENTS CALCULATE FROM DRIVE WHEEL CIRCUMFERENCE OR P.T.O. - RPM THE NUMBER OF REVOLUTIONS TO OPERATE EQUIPMENT FOR A SPECIFIED DISTANCE.

D. HAVE STUDENTS COLLECT AND MEASURE SEED DISBURSED FROM A TEST RUN OF EQUIPMENT.

E. HAVE STUDENTS PRACTICE MAKING ADJUSTMENTS TO EQUIPMENT TO OBTAIN CORRECT PLANTING RATE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING THE YIELD GOAL PLANNED AND GERMINATION PERCENTAGE OF A SEED LOT, HAVE THEM DETERMINE THE SEED SPACING IN THE ROW WITH 90% ACCURACY.

B. PROVIDE STUDENTS WITH SEVERAL SEED SIZES OF A CROP AND SEVERAL PLANTER PLATES WITH DIFFERENT SIZE SEED OPENINGS. HAVE THEM SELECT THE BEST SEED PLATE TO USE FOR EACH SEED SIZE.

C. GIVE STUDENTS SEVERAL RATES OF SPEED IN MPH THAT A SPECIFIC KIND OF PLANTING EQUIPMENT CAN BE MOVED, AND THE DESIRED RATE OF PLANTING, HAVE THEM DETERMINE THE CORRECT SPEED TO PLANT TO GET THE MOST ACCURATE RATE OF PLANTING.

D. FROM A LIST OF ADJUSTMENTS FOR A SPECIFIC PLANTER HAVE STUDENTS SELECT THOSE TO MAKE TO CORRECT INACCURATE PLANTING RATES.

2. A. PROVIDE STUDENTS WITH THE SEED OF A SPECIFIC CROP, HAVE THEM SELECT THE RATE TO APPLY PER ACRE, AND DEMONSTRATE THE ADJUSTMENTS OF THE PLANTING EQUIPMENT TO OBTAIN THE CORRECT RATE.

B. USING A SPECIFIED AREA TO BE USED FOR CALIBRATION PURPOSES, HAVE STUDENTS CALCULATE THE DISTANCE TO TRAVEL AND THE NUMBER OF REVOLUTIONS TO TURN THE DRIVE WHEEL FOR A SPECIFIC KIND OF PLANTING EQUIPMENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PLANTING EQUIPMENT OPERATION MANUALS
2. SEED OF TWO TO THREE CROPS GROWN IN THE AREA
3. PLANTING EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. PHIPPS, COOK, MC CALLY, AND SCRANTON. FARM MECHANICS TEXT AND HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1959, PP. 507-513.

   A TEXT BOOK EASILY UNDERSTOOD BY STUDENTS WHICH INCLUDES A DISCUSSION OF THE GENERAL PRINCIPLES OF CALIBRATING PLANTING EQUIPMENT PARTICULARLY THE GRAIN DRILL.

2. THE PLANTER - SELECTION, ADJUSTMENT, MAINTENANCE AND USE. VAS 3021. URBANA, ILLINOIS: VOCATIONAL AGRICULTURAL SERVICE, UNIVERSITY OF ILLINOIS. 40 PAGES.

   THIS REFERENCE GIVES INFORMATION REGARDING MOST PHASES OF PLANTER OPERATION.

3. RATE OF PLANTING CORN, A LABORATORY EXERCISE. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1963, 31 PAGES.

   A LABORATORY EXERCISE DESIGNED TO BE USED WITH A CORN PLANTING UNIT IN THE SHOP TO CHECK PLATE SELECTION AND ACCURACY OF DROP AT DIFFERENT SPEEDS OF OPERATION. INFORMATION CONCERNING THE MOST EFFECTIVE RATE TO PLANT CORN IS INCLUDED. NINE FULL PAGE CHARTS THAT MAY BE MADE INTO TRANSPARENCIES ARE INCLUDED.

PLANTING PROCEDURES AND PROCESSES

UNIT CONCEPT: PLANTING PROCEDURES AND PROCESSES INCLUDES DETERMINING THE SPEED TO OPERATE EQUIPMENT, THE SOIL CONDITIONS MOST SUITABLE FOR PLANTING, DEPTH TO PLANT AND INOCULATION OF LEGUME SEEDS PRIOR TO PLANTING. IT IS THE RESPONSIBILITY OF THE CROP PRODUCER TO PERFORM THESE JOBS SATISFACTORILY TO INSURE HIGH GERMINATION AND VIGOROUS PLANT GROWTH.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION REGARDING THE KIND OF CROP SEED TO BE PLANTED, THE RATE SEED IS TO BE PLANTED, AND THE KIND AND TYPE OF PLANTING EQUIPMENT TO BE USED, DETERMINE THE SPEED THE PLANTING EQUIPMENT WILL BE OPERATED IN ORDER TO INSURE THAT THE DESIRED AMOUNT OF SEED WILL BE PLANTED, FOLLOWING RECOMMENDATIONS OF THE EQUIPMENT MANUFACTURER AND AGRONOMY SPECIALISTS.

2. WHEN PROVIDED WITH INFORMATION REGARDING THE SOIL CONDITIONS OF A FIELD, OTHER THAN MOISTURE CONTENT, AND THE CROP SEED TO BE PLANTED, DETERMINE IF THE SOIL CONDITIONS ARE SUITABLE FOR PLANTING TO HELP INSURE A HIGH GERMINATION PERCENTAGE, THE DECISION BEING BASED ON AVAILABLE, APPROVED AGRONOMIC RESEARCH DATA AND RECOMMENDATIONS OF AGRONOMY SPECIALISTS.

3. WHEN PROVIDED WITH INFORMATION REGARDING THE MOISTURE CONTENT OF A SOIL, AND THE KIND OF CROP SEED TO BE PLANTED, DETERMINE THE DEPTH TO PLANT SEED, TO INSURE A HIGH GERMINATION, THE DECISION BEING MADE ACCORDING TO APPROVED AGRONOMIC RESEARCH DATA.

4. WHEN PROVIDED WITH A SPECIFIC LEGUME SEED TO BE PLANTED, DETERMINE THE INOCULANT MATERIAL TO USE, AND THE PROCEDURE FOR APPLYING IT TO THE SEEDS BEFORE PLANTING, TO INSURE ADEQUATE NODULE GROWTH, ACCORDING TO APPROVED AGRONOMIC PRACTICES, AND RECOMMENDATIONS OF THE INOCULANT MANUFACTURER.

B. INSTRUCTIONAL AREAS

1. DETERMINING ACCURACY OF SEED DROP OF PLANTING EQUIPMENT AT VARIOUS SPEEDS (MPH)

A. CALCULATING REVOLUTIONS OF PLANTER PLATES AT VARIOUS GROUND SPEEDS OF EQUIPMENT

B. CALCULATING REVOLUTIONS OF PLANTER PLATES AT THE SELECTED ROW SPACINGS OF SEED

2. DETERMINING ACCURACY OF SEED DROP USING PLATELESS TYPE PLANTER EQUIPMENT

   A. CHECKING ACCURACY OF SEED DROP AT VARIOUS GROUND SPEEDS OF EQUIPMENT

   B. CHECKING ACCURACY OF DROP AT THE SELECTED ROW SPACINGS OF SEED

3. DETERMINING THE IDEAL SIZE OF SOIL PARTICLES FOR THE KIND OF CROP SEED TO BE PLANTED

   A. SELECTING SOIL CONDITIONS FOR LARGER SEEDS

      (1) CORN
      (2) SOYBEANS
      (3) OTHERS

   B. SELECTING SOIL CONDITIONS FOR SMALLER SEEDS

      (1) WHEAT
      (2) OATS
      (3) OTHERS

   C. SELECTING SOIL CONDITIONS FOR VERY SMALL SEEDS THAT MAY BE SURFACE BROADCAST

      (1) CLOVER
      (2) ALFALFA
      (3) OTHERS

4. DETERMINING THE DEPTH TO PLANT THE SEED ACCORDING TO SOIL MOISTURE CONDITIONS

   A. SELECTING DEPTH FOR DRY SOIL CONDITIONS

      (1) LARGER SEEDS (CORN)
      (2) SMALLER SEEDS (WHEAT)
      (3) VERY SMALL LEGUME SEEDS (CLOVERS)

   B. SELECTING DEPTH FOR NORMAL SOIL MOISTURE CONDITIONS

      (1) LARGER SEEDS (CORN)
      (2) SMALLER SEEDS (WHEAT)
      (3) VERY SMALL LEGUME SEEDS (CLOVERS)

5. DETERMINING INOCULATION PROCEDURES TO USE FOR LEGUME SEED

    A. SELECTING INOCULANT MATERIAL FOR THE LEGUME SEED TO BE PLANTED

    B. DETERMINING LENGTH OF TIME SEED CAN BE INOCULATED BEFORE PLANTING

    C. SELECTING PROCEDURES FOR MIXING INOCULANT WITH LEGUME SEED

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USING A CORN PLANTER "PLANTING ASSEMBLY UNIT," OR A CORN PLANTER WITH A DRIVE WHEEL RAISED AND OPERATING THE PLANTING UNIT AT THE DESIRED SPEED WITH AN ELECTRIC MOTOR, HAVE STUDENTS CHECK ACCURACY OF SEED DROP BY OPERATING THE PLANTING UNIT AT VARIOUS SPEEDS. HAVE THEM SELECT THE SPEED AND SEED PLATES MOST SUITABLE FOR THE RATE OF PLANTING THEY HAVE SELECTED.

2. SHOW STUDENTS SEVERAL SOIL CONDITIONS WITH VARIOUS SIZE SOIL PARTICLES, USING REFERENCES AND DATA PROVIDING INFORMATION REGARDING SUITABLE SOIL CONDITIONS FOR PLANTING SEEDS OF CROPS, HAVE THEM SELECT THE SOIL CONDITIONS MOST IDEAL FOR EACH CROP THEY PLAN TO PLANT.

3. HAVE STUDENTS VISIT FIELDS TO BE PLANTED TO CROPS THAT HAVE DIFFERENT AMOUNTS OF MOISTURE IN THE SEED ZONE, USING REFERENCES PROVIDING INFORMATION ON DEPTH TO PLANT DIFFERENT CROP SEEDS ACCORDING TO THE SOIL MOISTURE, HAVE THEM SELECT DEPTHS TO PLANT DEPENDING ON SOIL MOISTURE CONTENT.

4. A. PROVIDE STUDENTS WITH INFORMATION REGARDING THE INOCULANT GROUPS FOR LEGUME CROPS; HAVE THEM PREPARE A LIST OF GROUPS APPLICABLE TO THE LEGUME CROPS THEY WILL PLANT.

    B. WITH A SMALL AMOUNT OF LEGUME SEED AND INOCULANT MATERIAL, DEMONSTRATE PROCEDURES FOR MIXING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PROVIDE STUDENTS WITH SAMPLES OF SEVERAL SIZES OF SEED CORN AND THE COMPLETE SET OF SEED PLATES FOR A PLANTER; HAVE EACH STUDENT MATCH THE SEED SIZE TO THE PLANTER SEED PLATE.

B. PROVIDE STUDENTS WITH THE RATE OF PLANTING (SEED SPACING IN THE ROW) AND INFORMATION REGARDING SPEED OF PLANTER TO REVOLUTIONS OF SEED PLATES; HAVE EACH STUDENT SELECT THE MPH PLANTER SHOULD TRAVEL FOR MOST ACCURATE SEED DROP.

2. FROM A LIST OF SOIL CONDITIONS WHICH DESCRIBE THE SIZE OF SOIL PARTICLES IN THE SEED ZONE AND A LIST OF CROP SEEDS TO BE PLANTED, HAVE EACH STUDENT SELECT THE SOIL CONDITION MOST SUITABLE FOR GERMINATION OF EACH OF THE CROP SEEDS.

3. PREPARE A LIST OF CROPS COMMON TO THE AREA; HAVE STUDENTS INDICATE DEPTH OF PLANTING FOR EACH CROP SEED UNDER NORMAL AND DRY SOIL CONDITIONS WITH 90% ACCURACY.

4. PROVIDE STUDENTS WITH A LIST OF LEGUME CROPS COMMON TO THE AREA; HAVE EACH STUDENT SELECT THE INOCULANT GROUP FOR EACH LEGUME AND DESCRIBE PROCEDURES FOR MIXING THE LEGUME SEED WITH INOCULANT WITH 90% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF DIFFERENT SEED SIZES OF CORN AND SOYBEANS
2. SEVERAL SIZES OF PLANTER SEED PLATES
3. SEVERAL SOIL SAMPLES
4. SAMPLES OF INOCULANT MATERIALS
5. OPERATOR'S MANUALS FOR PLANTING EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. PHIPPS, COOK, MC CALLY, SCRANTON. FARM MECHANICS TEXT AND HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1959, PP. 507-513.

   THIS GIVES INFORMATION ON CALIBRATION AND ADJUSTMENT OF THE GRAIN DRILL

2. THE PLANTER - SELECTION, ADJUSTMENT, MAINTENANCE AND USE VAS 3021. URBANA, ILLINOIS: VOCATIONAL AGRICULTURAL SERVICE, UNIVERSITY OF ILLINOIS. 40 PAGES.

   THIS REFERENCE GIVES INFORMATION ON PLANTER ADJUSTMENT AND OPERATION.

3. RATE OF PLANTING CORN, A LABORATORY EXERCISE. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1963, 31 PAGES.

A LABORATORY EXERCISE DESIGNED TO BE USED WITH A CORN PLANTING UNIT IN THE SHOP TO CHECK SEED PLATE SELECTION AND ACCURACY OF DROP AT DIFFERENT SPEEDS OF OPERATION.

NUTRIENT NEEDS OF FARM CROPS

UNIT CONCEPT: THE NUTRIENT NEEDS OF FARM CROPS SHOULD SERVE AS A BASIS FOR DETERMINING THE FERTILITY NEEDS. THE ABILITY TO DETERMINE THE NUTRIENT NEEDS FOR EACH CROP TO BE GROWN SHOULD RESULT IN MORE EFFICIENT AND ECONOMICAL CROP PRODUCTION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH THE NAMES OF THE VARIOUS NUTRIENTS NEEDED FOR PRODUCTION OF FARM CROPS, CLASSIFY THEM (PRIMARY, SECONDARY OR MICRO) ACCORDING TO THE AMOUNTS REQUIRED BY CROPS, AND DETERMINE THE VARIOUS FUNCTIONS EACH NUTRIENT SUPPLIES TO CROP PLANT GROWTH, IN ACCORDANCE WITH RECOGNIZED AGRONOMIC STANDARDS OF THE AREA.

2. WHEN GIVEN A CROP TO BE GROWN, DETERMINE THE AMOUNTS OF NUTRIENTS REQUIRED AT A SPECIFIED YIELD OF THE CROP, ACCORDING TO RECOGNIZED AGRONOMIC STANDARDS.

3. IDENTIFY FROM PLANTS WITH VISUALLY DETECTABLE NUTRIENT DEFICIENCIES WHICH NUTRIENT(S) ARE DEFICIENT IN THE GROWING CROP PLANTS TO THE EXTENT THAT A DIAGNOSIS OF THE PRESENT FERTILITY PRACTICES CAN BE MADE AND CORRECTIONS APPLIED FOR FUTURE USE, ACCORDING TO AGRONOMY STANDARDS FOR THE AREA.

B. INSTRUCTIONAL AREAS

1. CLASSIFYING NUTRIENTS

    A. ORGANIZING NUTRIENTS ACCORDING TO AMOUNTS REQUIRED BY CROPS

        (1) DETERMINING PRIMARY NUTRIENTS
        (2) DETERMINING SECONDARY NUTRIENTS
        (3) DETERMINING MICRO NUTRIENTS

    B. DETERMINING FUNCTIONS OF NUTRIENTS IN CROP PLANT GROWTH

    C. DETERMINING COMMON SOURCES OF NUTRIENTS

2. SELECTING SPECIFIC YIELD GOALS FOR CROPS
   A. DETERMINING PREVIOUS YIELDS OF THE FIELD
   B. SOIL PRODUCTIVITY OF A FIELD
3. CALCULATING NUTRIENT REQUIREMENTS AT SPECIFIC YIELD GOALS
4. IDENTIFYING CROP NUTRIENT DEFICIENCY SYMPTOMS
   A. DETERMINING GROWTH STAGE OF DIFFERENT CROP PLANTS WHEN NUTRIENT DEFICIENCY SYMPTOMS MAY APPEAR
   B. DETERMINING CHARACTERISTICS OF CROP PLANT PART WHERE NUTRIENT DEFICIENCY SYMPTOMS ARE MOST LIKELY TO APPEAR
5. MAKING PLANT TISSUE TESTS TO DETERMINE NUTRIENT DEFICIENCIES
   A. SAMPLING PLANT PARTS
   B. PREPARING PLANT SAMPLES FOR MAILING TO LABORATORY
   C. INTERPRETING THE LABORATORY REPORT
      (1) IDENTIFYING THE DEFICIENT NUTRIENTS
      (2) CALCULATING AMOUNT PER ACRE OF DEFICIENT NUTRIENTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE EACH STUDENT PREPARE A NUTRIENT INFORMATION CHART - ONE COLUMN, THE NUTRIENT NAME; A SECOND COLUMN, THE AMOUNTS IN POUNDS REQUIRED BY CROPS AT A SPECIFIED YIELD; AND A THIRD COLUMN, THE FUNCTIONS OF THE NUTRIENT FOR PLANT GROWTH AND DEVELOPMENT.

2. USING A LABORATORY NUTRIENT TEST REPORT, HAVE THE STUDENT DETERMINE THE DEFICIENT NUTRIENT AND CALCULATE THE AMOUNT OF DEFICIENCY.

3. A. USING LIVE PLANTS, COLOR SLIDES OR PICTURES SHOWING CROP PLANT NUTRIENT DEFICIENCY SYMPTOMS, HAVE THE STUDENT VIEW THE VISUAL AIDS AND DETERMINE THE DEFICIENT NUTRIENT OR NUTRIENTS.

   B. HAVE THE STUDENT TAKE PLANT PART SPECIMENS FROM NUTRIENT DEFICIENT PLANTS AND PREPARE THE SPECIMEN FOR A LABORATORY TEST.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP TEST ITEMS FOR STUDENTS TO MATCH:

   A. THE NAME OF THE NUTRIENT TO ITS CLASSIFICATION AS TO PRIMARY, SECONDARY OR MICRO

   B. THE NAME OF THE NUTRIENT TO THE FUNCTIONS OF PLANT GROWTH AND DEVELOPMENT IT PROVIDES

2. GIVE STUDENTS A LIST OF FARM CROPS AND HAVE STUDENTS CHECK WHETHER THE CROPS HAVE A "HIGH,' "MEDIUM" OR "LOW" REQUIREMENT FOR NITROGEN, PHOSPHORUS AND POTASSIUM.

3. HAVE THE STUDENT REVIEW A PLANT TISSUE TEST REPORT OF NUTRIENT DEFICIENCIES AND CORRECTLY DETERMINE THE NUTRIENT(S) THAT ARE DEFICIENT, AND CALCULATE THE AMOUNT OF DEFICIENCY PER ACRE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES, OR OTHER VISUAL AIDS SHOWING NUTRIENT DEFICIENCIES IN FARM CROP PLANTS

2. SAMPLES OF CONTAINERS AND INFORMATION SHEETS USED TO MAIL PLANT TISSUE SPECIMENS FOR LABORATORY TESTING

3. REPORT FORMS OF LABORATORY TESTS FOR PLANT NUTRIENT DEFICIENCIES

F. EXAMPLES OF SUPPORTING REFERENCES

1. COURSON, R.L. HUNGER SIGNS IN CROPS. VAS 4011A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1968, 12 PAGES.

   A 12-PAGE SUBJECT MATTER UNIT GIVES SOME OF THE COMMON HUNGER SIGNS IN CROPS. IT CONTAINS SIX COLOR PLATES SHOWING DEFICIENCY SYMPTOMS. DIRECTIONS FOR TISSUE TESTING AND HOW HUNGER SIGNS CAN GUIDE IN PLANNING A FERTILITY PROGRAM ARE ALSO GIVEN.

2. OUR LAND AND ITS CARE. WASHINGTON, D.C.: NATIONAL PLANT FOOD INSTITUTE.

   PAGES 20-40 OF THIS BULLETIN GIVE CONCISE INFORMATION ON AMOUNTS OF THE DIFFERENT NUTRIENTS REQUIRED AT A SPECIFIED YIELD. IT ALSO PROVIDES INFORMATION ON THE FUNCTIONS OF NUTRIENTS FOR CROP GROWTH AND DEVELOPMENT. COLOR PICTURES OF MANY NUTRIENT DEFICIENCIES ARE PROVIDED.

DETERMINING FERTILITY NEEDS

UNIT CONCEPT: FERTILITY NEEDS ARE, TO A LARGE EXTENT, DETERMINED BY THE CROP TO BE GROWN, THE YIELD GOAL OF THE CROP, AVAILABLE NUTRIENTS IN THE SOIL, AMOUNT AND KIND OF MANURE APPLIED, AND THE PREVIOUS CROP GROWN ON THE FIELD. AN ACCURATE DETERMINATION OF THESE FACTORS OF NUTRIENT REQUIREMENTS AND SOURCES IS NECESSARY TO DETERMINE THE RIGHT AMOUNTS AND KINDS OF SUPPLEMENTAL FERTILITY MATERIALS AT THE LEAST COST.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A CROP TO BE GROWN, DETERMINE THE YIELD GOAL OF THE CROP BASED ON THE YIELD POTENTIAL OF THE SOIL TYPE OF THE FIELD ACCORDING TO AGRONOMY STANDARDS FOR THE LOCAL AREA.

2. USING THE NEEDED SOIL SAMPLING EQUIPMENT, COLLECT A REPRESENTATIVE SOIL SAMPLE OF A FIELD AND PREPARE FOR TESTING IN A MANNER AND IN ACCORDANCE WITH RECOMMENDATIONS PRESCRIBED BY THE TEACHER, COUNTY AGRICULTURAL AGENT OR PERSONNEL OF THE SOIL TESTING LABORATORY.

3. USING A SOIL TEST REPORT FROM THE SOIL TESTING LABORATORY AND USING THE CALCULATING PROCEDURES RECOMMENDED BY THE TEACHER, COUNTY EXTENSION AGENT OR PERSONNEL OF THE SOIL TESTING LABORATORY, CALCULATE THE NUTRIENTS AVAILABLE IN THE SOIL WITH ACCURACY.

4. WHEN GIVEN THE PREVIOUS CROP GROWN ON A FIELD, CALCULATE THE NUTRIENTS SUPPLIED BY THE CROP RESIDUE ACCORDING TO AGRONOMY DATA FOR CROP RESIDUE FERTILITY.

5. WHEN GIVEN THE AMOUNT AND KIND OF MANURE APPLIED TO A FIELD, CALCULATE THE NUTRIENTS SUPPLIED BY THE MANURE ACCORDING TO PUBLISHED DATA ON LIVESTOCK WASTE FERTILITY.

6. WHEN PRESENTED WITH THE YIELD GOAL OF A CROP TO BE GROWN, THE AMOUNT AND KIND OF NUTRIENTS SUPPLIED BY THE SOIL, MANURE AND CROP RESIDUES, DETERMINE THE AMOUNT AND KIND OF ADDITIONAL NUTRIENTS REQUIRED BY THE PLANTS AND WHICH WILL BE SUPPLIED BY SUPPLEMENTAL FERTILITY MATERIALS.

B. INSTRUCTIONAL AREAS

1. DETERMINING CROP YIELD GOALS FOR A FIELD
    A. ANALYZING INFORMATION OF YIELD POTENTIALS FOR THE SOIL TYPES OF A FIELD
    B. EVALUATING INFORMATION OF PREVIOUS CROP YIELDS FROM THE FIELD
    C. DETERMINING THE AMOUNTS OF FERTILITY MATERIALS THAT WILL BE SUPPLIED TO THE FIELD
2. COLLECTING A SOIL SAMPLE
    A. CHOOSING THE TIME OF YEAR TO SAMPLE
    B. LOCATING THE DIFFERENT SOIL TYPES, ABNORMAL GROWTH, DRAINAGE AND SPILLED FERTILIZER AREAS OF A FIELD
    C. DETERMINING THE KIND OF SAMPLING EQUIPMENT TO USE
    D. SAMPLING PROCEDURES FOR REPRESENTATIVE SAMPLE
3. PREPARING THE SAMPLE FOR TESTING
    A. DRYING THE SAMPLE
    B. PULVERIZING THE SAMPLE
4. PROVIDING FIELD INFORMATION FOR SOILS LABORATORY
    A. SOIL TYPE
    B. YIELD GOAL
    C. PREVIOUS CROPS GROWN DURING THE PAST 5 YEARS
5. CALCULATING AVAILABLE NUTRIENTS IN THE SOIL USING PROCEDURES PRESCRIBED BY SOILS LABORATORY REPORT
6. DETERMINING NUTRIENTS AVAILABLE FROM CROP RESIDUES
    A. ESTIMATING AMOUNTS OF RESIDUE ON A FIELD
    B. DETERMINING AMOUNTS AND KINDS OF NUTRIENTS HELD UNAVAILABLE BY STALKS AND STRAW
    C. DETERMINING AMOUNTS AND KINDS OF NUTRIENTS SUPPLIED BY SOD CROPS
6. DETERMINING AMOUNTS AND KINDS OF NUTRIENTS SUPPLIED BY MANURE

A. ESTIMATING AMOUNT OF MANURE APPLIED OR TO BE APPLIED TO A FIELD

B. DETERMINING CONDITION OF MANURE

(1) THE EFFECT OF WEATHER EXPOSURE
(2) THE EFFECT OF STORAGE OR HOLDING TIME

8. DETERMINING AMOUNTS OF SUPPLEMENTAL FERTILITY MATERIALS REQUIRED

A. DETERMINING TOTAL NUTRIENT REQUIREMENTS BASED ON YIELD GOAL

B. DETERMINING AMOUNTS OF NUTRIENTS SUPPLIED BY SOIL, MANURE AND CROP RESIDUES

C. CALCULATING NUTRIENT DEFICIENCY

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USING INFORMATION ON YIELD POTENTIALS OF CROPS ON DIFFERENT SOIL TYPES, HAVE STUDENTS DETERMINE YIELD GOALS FOR THE CROPS THEY PLAN TO PRODUCE.

2. A. HAVE STUDENTS, EITHER AS A GROUP OR INDIVIDUALLY, COLLECT A REPRESENTATIVE SOIL SAMPLE FROM A FIELD ACCORDING TO RECOMMENDED SAMPLING PROCEDURES.

B. HAVE STUDENTS, INDIVIDUALLY OR AS A GROUP, CONFER WITH THE EXTENSION AGENT OR SOILS LABORATORY PERSONNEL FOR THE PURPOSE OF DETERMINING PROCEDURES FOR PREPARING SAMPLES AND PROVIDING INFORMATION OF THE SAMPLED FIELD.

C. VIEW SLIDES, PICTURES OR OTHER VISUALS SHOWING SOIL SAMPLING AND SAMPLE PREPARATION INFORMATION.

3. USING A SOIL TEST REPORT, HAVE STUDENTS CALCULATE THE AMOUNTS OF AVAILABLE NUTRIENTS FROM INFORMATION PROVIDED IN THE REPORT.

4. USING INFORMATION FROM THE SOIL LABORATORY REPORT AND OTHER REFERENCES, HAVE STUDENTS CALCULATE THE AMOUNT AND KIND OF NUTRIENTS SUPPLIED OR HELD UNAVAILABLE FROM CROP RESIDUES. AN ACCURATE ESTIMATE OF THE AMOUNT OF RESIDUE ON THE FIELD SHOULD BE MADE.

5. USING INFORMATION FROM REFERENCES IN REGARD TO THE NUTRIENTS SUPPLIED BY MANURE, HAVE STUDENTS CALCULATE THE AMOUNT AND KIND OF NUTRIENTS SUPPLIED. AN ACCURATE ESTIMATE OF THE AMOUNT OF MANURE APPLIED AND AN EVALUATION OF ITS CONDITION SHOULD BE MADE.

6. USING INFORMATION REGARDING YIELD GOAL OF A CROP AND FIELD INFORMATION REGARDING NUTRIENTS SUPPLIED BY THE SOIL, MANURE AND CROP RESIDUES, HAVE STUDENTS CALCULATE THE NUTRIENT DEFICIENCIES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE STUDENTS INFORMATION FOR A FIELD IN REGARD TO SOIL TYPE AND CROP TO BE GROWN AND, USING SOIL TYPE YIELD POTENTIAL INFORMATION, HAVE THEM DETERMINE THE YIELD GOAL.

2. A. HAVE STUDENTS DEMONSTRATE CORRECT SOIL SAMPLING PROCEDURES UNDER ACTUAL FIELD CONDITIONS. IF THIS PROCEDURE IS IMPOSSIBLE TO USE, HAVE STUDENTS LIST THE STEPS IN COLLECTING A REPRESENTATIVE SOIL SAMPLE OF A FIELD.

   B. HAVE STUDENTS DEMONSTRATE THE PROPER PROCEDURE FOR PREPARING A SOIL SAMPLE FOR LABORATORY TESTING.

3. FROM A SPECIFIC SOIL TEST REPORT, HAVE STUDENTS CALCULATE THE AMOUNTS AND KINDS OF NUTRIENTS AVAILABLE IN THE SOIL.

4. PROVIDE STUDENTS WITH SPECIFIC INFORMATION IN REGARD TO AMOUNT AND KIND OF CROP RESIDUE ON A FIELD; HAVE STUDENTS CALCULATE THE AMOUNTS OF NUTRIENTS AVAILABLE OR MADE UNAVAILABLE, DEPENDING ON THE KIND OF CROP RESIDUE.

5. PROVIDE STUDENTS WITH SPECIFIC INFORMATION IN REGARD TO THE AMOUNT AND CONDITION OF MANURE APPLIED TO A FIELD; HAVE STUDENTS CALCULATE THE AMOUNTS OF NUTRIENTS SUPPLIED BY THE MANURE.

6. A. PROVIDE STUDENTS WITH SPECIFIC INFORMATION IN REGARD TO ALL THE NUTRIENT SOURCES OTHER THAN COMMERCIAL SOURCES; HAVE STUDENTS PREPARE A REPORT GIVING THE TOTAL AMOUNTS AND KINDS OF NUTIENTS AVAILABLE.

   B. PROVIDE STUDENTS WITH INFORMATION REGARDING THE YIELD GOAL OF A CROP AND THE AMOUNTS AND KINDS OF NUTRIENTS SUPPLIED FROM THE SOIL, MANURE AND CROP RESIDUES; HAVE EACH STUDENT PREPARE A NUTRIENT BUDGET SHEET WHICH SHOULD SUPPLY INFORMATION REGARDING THE KIND AND AMOUNT OF NUTRIENT DEFICIENCY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SOIL SAMPLING EQUIPMENT - PROBE, AUGER OR SPADE, SOIL COLLECTION CONTAINERS
2. MORTAR AND PESTLE
3. FARM SOIL INFORMATION MAPS FROM SOIL CONSERVATION SERVICE OFFICE
4. SOIL SAMPLE MAILING CONTAINERS
5. SOIL SAMPLE INFORMATION SHEETS
6. SOIL TEST REPORT FORMS
7. SLIDES, PICTURES AND CHARTS OF SOIL SAMPLING PROCEDURES

F. EXAMPLES OF SUPPORTING REFERENCES

1. HOW TO TAKE A GOOD SOIL SAMPLE. LEAFLET 168. COLUMBUS, OHIO: OHIO EXTENSION SERVICE, THE OHIO STATE UNIVERSITY. 1970, 3 PAGES.

   THIS LEAFLET GIVES DETAILED STEPS IN COLLECTING A REPRESENTATIVE SOIL SAMPLE OF A FIELD.

2. STATE AGRONOMY GUIDES. USE THE LATEST ISSUES.

   MANY STATE EXTENSION SERVICES PUBLISH AGRONOMY GUIDES ANNUALLY OR BIANNUALLY. MANY OF THESE GUIDES PROVIDE INFORMATION IN REGARD TO PRODUCTIVITY OF DIFFERENT SOIL TYPES, SOIL TESTING AND PLANT ANALYSIS INFORMATION.

SELECTION AND APPLICATION OF LIME AND FERTILIZER

UNIT CONCEPT: TO REACH THE DESIRED CROP YIELD GOALS, MOST FIELDS REQUIRE SUPPLEMENTAL FERTILITY MATERIALS TO SUPPLY THE NUTRIENT NEEDS. THERE ARE USUALLY SEVERAL CHOICES OF MATERIALS WHICH CAN BE USED TO SUPPLY ANY ONE OF THE NUTRIENT NEEDS BUT THEY MAY VARY IN SUCH FACTORS AS CHEMICAL REACTIONS, PHYSICAL FORMS OR COST. IN ORDER THAT THE FERTILITY MATERIAL CAN BE CHOSEN WHICH IS MOST APPROPRIATE FOR A GIVEN SITUATION, AN UNDERSTANDING IS NEEDED OF THE CHARACTERISTICS OF THE FERTILITY MATERIALS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE CHEMICAL COMPOUNDS (OXIDES) OF FERTILIZER MATERIALS, CONVERT THE OXIDE POUNDS TO ELEMENT POUNDS OF NUTRIENTS TO DETERMINE THE ACTUAL AMOUNT OF NUTRIENTS SUPPLIED WITH THE ACCURACY REQUIRED OF AN AGRONOMY SPECIALIST.

2. WHEN GIVEN THE FERTILITY NEEDS OF A CROP ABOVE THOSE SUPPLIED FROM THE SOIL, MANURE AND CROP RESIDUES, DETERMINE THE AMOUNT, GRADE AND RATIO OF THE FERTILIZER MATERIAL REQUIRED BASED ON THE LOWEST COST PER UNIT OF NUTRIENT.

3. WHEN GIVEN THE CHEMICAL SOURCES OF LIME OR FERTILIZER MATERIALS, DEFINE THE MAJOR CHARACTERISTICS OF EACH SOURCE IN CHEMICAL REACTIONS, SUCH AS AVAILABILITY, LEACHING OR VOLATILIZATION, EFFECT ON SOIL PH TOXICITY TO PLANTS, PHYSICAL FORM AND COST FOR A CROP AND SOIL TYPE.

4. WHEN GIVEN THE AMOUNT, GRADE AND RATIO OF A FERTILIZER MATERIAL FOR A CROP PRODUCTION FIELD, DETERMINE THE SUPPLY SOURCE OF THE MATERIALS BASED ON CONVENIENCE, ECONOMY AND AVAILABILITY WITH ACCURACY AND COMPLETENESS TO THE SATISFACTION OF THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. CONVERTING POUNDS OF CHEMICAL COMPOUNDS (OXIDES) OF FERTILIZER MATERIALS TO POUNDS OF THE ELEMENT

   A. CONVERTING POUNDS OF PHOSPHORUS PENTOXIDE TO POUNDS OF PHOSPHORUS

B. CONVERTING POUNDS OF POTASSIUM OXIDE TO POUNDS OF POTASSIUM

2. COMPARING COSTS OF LIME AND FERTILIZER

A. CALCULATING COSTS PER UNIT OF NUTRIENT OF DRY FERTILIZER MATERIALS

B. CALCULATING COSTS PER UNIT OF NUTRIENT OF LIQUID FERTILIZER MATERIALS

(1) WEIGHT PER UNIT OF VOLUME
(2) PERCENT OF AVAILABLE NUTRIENTS

3. COMPARING LIME AND FERTILIZER MATERIALS AS TO HOW SOON THE NUTRIENTS BECOME AVAILABLE

A. FINENESS OF LIME MATERIALS

B. DETERMINING TOTAL NEUTRALIZING POWER OF LIME MATERIALS

C. CHEMICAL COMPOSITION OF FERTILIZER MATERIALS

4. COMPARING SUPPLY SOURCES OF LIME AND FERTILIZER MATERIALS

A. COMPARING COSTS PER UNIT OF MATERIALS

B. COMPARING DELIVERY AND APPLICATION COSTS

C. COMPARING CREDIT COSTS

D. COMPARING OTHER SERVICES AVAILABLE

(1) SOIL SAMPLING
(2) SOIL TESTING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USING DIFFERENT GRADES AND RATIOS OF FERTILIZER MATERIALS, HAVE STUDENTS CALCULATE THE AMOUNTS OF ELEMENTAL PHOSPHORUS AND POTASSIUM IN THE MATERIALS.

2. USING DIFFERENT GRADES AND RATIOS OF FERTILIZERS AND DIFFERENT TOTAL NEUTRALIZING POWERS OF LIME, HAVE STUDENTS CALCULATE THE COST TO SUPPLY A UNIT OF NUTRIENTS, COMPARE THE COSTS AND SELECT THE MOST ECONOMICAL ONES TO BUY.

3. USING THE CHEMICAL COMPOSITION OF FERTILIZER AND THE FINENESS RATING OF LIME, HAVE STUDENTS DEVELOP A TIME-AVAILABILITY CHART: ONE COLUMN BEING THE CHEMICAL COMPOSITION OR FINENESS RATING; THE OTHER COLUMN, THE AVAILABILITY RATING.

4. HAVE STUDENTS, EITHER INDIVIDUALLY OR AS A GROUP, CONTACT FERTILIZER AND LIME DEALERS FOR THE PURPOSE OF OBTAINING INFORMATION IN REGARD TO MATERIALS AVAILABLE, COSTS OF MATERIALS AND SERVICES SUPPLIES. HAVE EACH STUDENT PREPARE A RATING SHEET OF THE AVAILABILITY, SERVICE AND COSTS OF MATERIALS AMONG THE DEALERS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH THE AMOUNTS OF PHOSPHORUS AND POTASSIUM COMPOUNDS (OXIDES) IN SEVERAL FERTILIZER GRADES. HAVE EACH STUDENT LIST THE OXIDE AMOUNT IN ONE COLUMN; IN THE SECOND COLUMN, LIST THE AMOUNT OF THE ELEMENT FOR EACH FERTILIZER MATERIAL.

2. A. PROVIDE STUDENTS WITH SEVERAL GRADES AND RATIOS OF FERTILIZER MATERIALS ALONG WITH THE COST AND AMOUNT OF MATERIAL TO BE SUPPLIED. HAVE EACH STUDENT CALCULATE THE COST PER POUND OF NUTRIENTS FOR EACH MATERIAL, COMPARE THE COSTS AND SELECT THE MOST ECONOMICAL ONE.

   B. PROVIDE STUDENTS WITH THE AMOUNT AND KIND OF NUTRIENTS THAT NEED TO BE SUPPLIED FOR A SPECIFIC CROP-GROWING SITUATION WHERE THE CROP YIELD GOAL IS GIVEN. HAVE EACH STUDENT SELECT THE AMOUNT, GRADE AND RATIO OF THE FERTILIZER MATERIAL TO USE.

3. A. PROVIDE STUDENTS WITH THE NAMES OF SEVERAL FERTILIZER MATERIALS THAT HAVE DIFFERENT CHEMICAL SOURCES OF THE NUTRIENTS. HAVE STUDENTS LIST THE MATERIALS IN ONE COLUMN; IN A SECOND COLUMN, LIST THE CHEMICAL SOURCES; AND IN A THIRD COLUMN, HAVE THEM EVALUATE THE SOURCES AS TO RAPIDITY OF AVAILABILITY OF THE NUTRIENTS.

   B. FOLLOW THE SAME PROCEDURE AS IN 3-A, EXCEPT SUBSTITUTE LIME MATERIALS IN COLUMN ONE AND FINENESS OF MATERIAL IN COLUMN TWO. EVALUATE IN COLUMN 3 AS IN 3.A.

4. HAVE EACH STUDENT PREPARE A WRITTEN DESCRIPTION OF THE FERTILITY NEEDS OF A CROP PRODUCTION FIELD, INCLUDING IN THE DESCRIPTION THE AMOUNT, GRADE AND RATIO OF THE FERTILIZER MATERIALS. PROVIDE THEM WITH COSTS AND SERVICES OF FERTILIZER DEALERS. HAVE EACH STUDENT SELECT THE DEALER HE WILL USE, GIVING VALID REASONS FOR HIS SELECTION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CONVERSION CHARTS OF OXIDE-TO-ELEMENT FORM OF PHOSPHATE AND POTASH. STATE AGRONOMY GUIDES.
2. LIMING ACID SOILS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, OHIO STATE UNIVERSITY. 1971. A SERIES OF 116 COLOR SLIDES.
3. FERTILIZER AND LIME SAMPLES
4. LIME SIEVES

F. EXAMPLES OF SUPPORTING REFERENCES

1. COURSON, R. L. PLANNING THE NITROGEN PROGRAM. VAS 4009A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1969, 16 PAGES.

   SUBJECT MATTER ITEMS DISCUSSED INCLUDE: (1) COMMON CARRIERS OF NITROGEN, (2) CHEAPEST FORMS TO BUY, (3) HOW MUCH TO APPLY PER ACRE, AND (4) WHEN AND HOW TO APPLY FERTILIZER.

2. GARMION, ED. FERTILIZER HANDBOOK. WASHINGTON, D.C.: NATIONAL PLANT FOOD INSTITUTE.

   USEFUL IN EVALUATING FERTILIZER GRADES AND RATIONS, CALCULATING AVAILABLE NUTRIENTS IN DIFFERENT FERTILIZER MATERIALS AND CALCULATION COSTS.

METHODS OF FERTILIZER APPLICATION AND PLACEMENT

UNIT CONCEPT: SEVERAL METHODS OF FERTILIZER APPLICATION AND PLACEMENT ARE AVAILABLE FOR THE CROP PRODUCER TO USE. SELECTION OF THE METHOD TO USE SHOULD BE BASED ON THE AMOUNT, GRADE AND RATIO OF THE FERTILIZER MATERIAL, THE TYPE OF SOIL ON WHICH IT IS TO BE APPLIED, THE CROP TO BE FERTILIZED, AND THE METHOD WHICH PROVIDES THE MOST ECONOMY, EFFICIENCY AND SAFETY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED INFORMATION ABOUT THE CROP TO BE FERTILIZED, THE AMOUNT, GRADE AND RATIO OF THE FERTILIZER TO BE USED, DETERMINE THE METHOD OR METHODS OF APPLICATION TO USE, BASED ON ECONOMY AND EFFICIENCY AND ACCORDING TO RECOMMENDATIONS OF AGRONOMY SPECIALISTS.

2. FOR A GIVEN CROP AND METHOD OF FERTILIZER APPLICATION, DETERMINE THE MAXIMUM AMOUNT OF COMBINATIONS OF NITROGEN AND POTASH SALTS THAT CAN BE APPLIED WITHOUT DAMAGING THE GERMINATING SEED, IN ACCORDANCE WITH RECOMMENDATIONS OF AGRONOMY SPECIALISTS.

3. FROM A RECOMMENDED RATE OF FERTILIZER APPLICATION PER ACRE, ADJUST THE APPLICATION EQUIPMENT TO APPLY THE CORRECT AMOUNT WITH 100% ACCURACY.

4. CONSIDERING THE USE OF BULK APPLICATIONS OF FERTILIZER, DETERMINE THE OPTIMUM TIME OF YEAR THE MATERIAL SHOULD BE APPLIED BASED ON SEASONAL COSTS OF MATERIALS AND THE MINIMUM LOSS FROM LEACHING OF NUTRIENTS, ACCORDING TO RECOMMENDATIONS OF AGRONOMY SPECIALISTS.

5. WHEN PRESENTED WITH THE APPLICATION OF FERTILIZERS OF A HAZARDOUS NATURE, DETERMINE AND USE PROTECTIVE PROCEDURES WHEN HANDLING AND APPLYING THE MATERIALS, IN ACCORDANCE WITH SAFETY PROCEDURES AS PROVIDED BY THE MANUFACTURER OF THE MATERIAL.

B. INSTRUCTIONAL AREAS

1. SELECTING METHODS OF FERTILIZER APPLICATION

A. SELECTION BASED ON CROP TO BE PRODUCED

B. COMPARING METHODS OF APPLICATION BASED ON COST TO APPLY

C. COMPARING METHODS OF APPLICATION BASED ON POSSIBLE LOSS FROM LEACHING OR RUN-OFF

2. DETERMINING AMOUNTS AND KINDS OF FERTILIZER MATERIALS THAT MAY DAMAGE GERMINATING SEED

A. SELECTING SOURCES OF FERTILIZER MATERIALS THAT MAY CAUSE DAMAGE

B. EVALUATING PLACEMENT DISTANCE OF FERTILIZER APPLICATION EQUIPMENT

C. DETERMINING AMOUNTS OF SALTS, SINGLY OR IN COMBINATION, THAT MAY CAUSE DAMAGE

3. CALIBRATING FERTILIZER APPLICATION EQUIPMENT FOR ACCURACY

A. ADJUSTING ROW APPLICATION EQUIPMENT

(1) LIQUID
(2) DRY

B. ADJUSTING BULK APPLICATION EQUIPMENT

(1) LIQUID-SURFACE
(2) DRY-SURFACE
(3) LIQUID-SOIL INSERTION
(4) DRY-SOIL INSERTION
(5) GAS-SOIL INSERTION
(6) FOLIAR APPLICATION

4. MAKING BULK APPLICATIONS OF FERTILIZER OR LIME

A. DETERMINING TIME REQUIRED FOR THE NUTRIENTS IN DIFFERENT FERTILIZER AND LIME MATERIALS TO BECOME AVAILABLE

B. COMPARING SEASONAL COSTS OF MATERIALS

C. DETERMINING POSSIBLE LOSSES OF MATERIALS FROM LEACHING AND RUN-OFF

5. PLANNING SAFETY PRECAUTIONS IN APPLYING FERTILIZERS

A. LISTING OF CHEMICAL COMPOUNDS OF FERTILIZERS THAT ARE HAZARDOUS

B. PLANNING PRECAUTIONS IN HANDLING AND APPLYING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USING REFERENCES THAT DESCRIBE METHODS OF FERTILIZER APPLICATIONS, PREPARE DESCRIPTION CHART. IN ONE COLUMN, LIST THE CROPS SUGGESTED TO USE THE METHOD; IN THE SECOND COLUMN, LIST DIFFERENT METHODS OF APPLICATION; AND IN THE THIRD COLUMN, LIST COSTS AND OTHER FACTS IN REGARD TO EACH METHOD.

   B. HAVE STUDENTS AS A GROUP OR INDIVIDUALLY, CONTACT OR VISIT AN IMPLEMENT DEALER OR FERTILIZER SUPPLY CENTER FOR THE PURPOSE OF GETTING INFORMATION ON APPLICATION METHODS.

2. A. HAVE STUDENTS CALCULATE AMOUNTS OF FERTILIZER SALTS IN COMBINATIONS FROM DIFFERENT AMOUNTS OF FERTILIZER GRADES.

   B. HAVE STUDENTS INVENTORY THEIR OWN ROW PLACEMENT FERTILIZER APPLICATION EQUIPMENT TO DETERMINE PLACEMENT OF FERTILIZER IN RELATION TO SEED.

3. HAVE STUDENTS INDIVIDUALLY OR AS A GROUP VISIT A FARM OR EQUIPMENT DEALER AND CALIBRATE FERTILIZER APPLICATION EQUIPMENT.

4. A. HAVE STUDENTS PREPARE A LIST OF FERTILIZER MATERIALS THAT ARE PRACTICAL TO USE AS BULK APPLICATIONS.

   B. HAVE STUDENTS PREPARE A SEASONAL COST CHART OF FERTILIZER MATERIALS.

   C. HAVE STUDENTS PREPARE A LIST OF THOSE MATERIALS AND APPLICATION PROCEDURES THAT MAY CAUSE NUTRIENTS TO BE LOST BY LEACHING OR RUN-OFF.

5. A. HAVE STUDENTS PREPARE A LIST OF FERTILIZER MATERIALS THAT ARE OF A HAZARDOUS NATURE.

   B. HAVE STUDENTS INDIVIDUALLY OR AS A GROUP VISIT A FERTILIZER SUPPLY DEALER-APPLICATOR AND PREPARE A LIST OF PRECAUTIONS USED IN HANDLING AND APPLYING MATERIALS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH A CROP GROWING SITUATION WHERE THE FERTILIZER NEEDS ARE SUCH THAT MORE THAN ONE METHOD OF APPLICATION WILL BE NEEDED. HAVE EACH STUDENT PREPARE A WRITTEN PLAN OF APPLICATION METHODS THAT WILL BE USED TO SUPPLY THE NEEDED NUTRIENTS.

2. PROVIDE STUDENTS WITH A PROBLEM OF APPLICATION OF ROW PLACEMENT OF FERTILIZER INCLUDING A DESCRIPTION OF THE APPLICATION EQUIPMENT TO BE USED, AND THE AMOUNT, GRADE AND RATIO OF THE FERTILIZER MATERIAL. HAVE THEM DECIDE IF DAMAGE TO SEED GERMINATION MAY OCCUR.

3. HAVE THE STUDENTS DEMONSTRATE THE PROCEDURE TO FOLLOW IN CALIBRATING FERTILIZER APPLICATION EQUIPMENT.

4. PROVIDE STUDENTS WITH A PROBLEM OF BULK APPLICATION FERTILIZING OF A CROP. HAVE THEM LIST THE MATERIAL TO USE, TIME OF YEAR TO BUY AND APPLY THE MATERIAL.

5. DEVELOP A MATCHING TEST TO HAVE STUDENTS MATCH THE NAMES OF FERTILIZER MATERIALS OF A HAZARDOUS NATURE WITH SAFETY PRECAUTIONS THAT SHOULD BE USED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR CHARTS OF FERTILIZER APPLICATION EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. ALDRICH, SAMUEL ROY, AND LENG, EARL R. MODERN CORN PRODUCTION. CINCINNATI, OHIO: THE F & W PUBLISHING CO. 1966, 308 PAGES.

   CONTAINS DETAILED INFORMATION ON ALL PHASES OF CORN PLANT NUTRITION AND USING FERTILIZERS.

2. BASIC CORE CURRICULUM GUIDE FOR VOCATIONAL AGRICULTURE I, II, III AND IV. STILLWATER, OKLAHOMA: CURRICULUM AND INSTRUCTIONAL MATERIAL CENTER, VOCATIONAL AND TECHNICAL EDUCATION, OKLAHOMA STATE DEPARTMENT. 1970.

   UNITS OF INSTRUCTION HAVE BEEN DEVELOPED PROVIDING VISUALS, LABORATORY EXERCISES, AND TESTS FOR VARIOUS METHODS OF FERTILIZER APPLICATION.

3. FERTILIZER HANDBOOK. WASHINGTON, D.C.: THE FERTILIZER INSTITUTE.

   CONTAINS INFORMATION ON KINDS OF FERTILIZERS, APPLICATION AND PLACEMENT.

4. HUGHES AND METCALFE. CROP PRODUCTION, 3RD EDITION. NEW YORK, NEW YORK: THE MACMILLAN COMPANY. 1972, 650 PAGES.

PROVIDES INFORMATION ON SELECTION AND USE OF FERTILIZERS FOR CORN, SOYBEANS, COTTON, PEANUTS, SORGHUM AND SEVERAL OTHER CROPS. REFER TO CHAPTER HEADINGS.

5. SCOTT, WALTER O. AND ALDRICH, SAMUEL R. MODERN SOYBEAN PRODUCTION. CINCINNATI, OHIO: THE FARM QUARTERLY. 1970, 192 PAGES.

   CONTAINS DETAILED INFORMATION ON ALL PHASES OF SOYBEAN PLANT NUTRITION AND USING FERTILIZERS.

6. STATE AGRONOMY GUIDES. STATE EXTENSION SERVICE.

   MANY STATE EXTENSION SERVICES PUBLISH ANNUALLY OR BIANNUALLY "AGRONOMY GUIDES." SOME WILL PROVIDE INFORMATION ON METHODS OF FERTILIZER APPLICATION. CHECK WITH YOUR LOCAL EXTENSION PERSONNEL FOR SPECIFIC INFORMATION ON AVAILABILITY.

EFFECTS OF FERTILIZER CHEMICALS ON THE ECOLOGY

UNIT CONCEPT: THE EFFECT OF CHEMICALS, INCLUDING FERTILIZERS, ON THE ENVIRONMENT HAS BECOME A NATIONAL PROBLEM. IN AN EFFORT TO PRODUCE HIGHER YIELDS THROUGH THE USE OF INCREASED AMOUNTS OF CHEMICAL FERTILIZERS, THE CROP PRODUCER SHOULD GIVE CONSIDERATION TO AMOUNTS AND KINDS OF MATERIALS TO USE, TIME AND METHOD OF APPLICATIONS, AND SOIL TYPES WHERE APPLICATIONS ARE TO BE MADE WHICH MAY HAVE AN ADVERSE EFFECT ON THE ENVIRONMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE PLANS FOR THE FERTILIZATION OF A FIELD, DETERMINE THE EXTENT THAT SOIL AND WATER POLLUTION MAY OCCUR FROM THE FERTILIZER APPLICATION, WHICH MAY HAVE AN ADVERSE EFFECT ON THE ENVIRONMENT, IN ACCORDANCE WITH REGULATIONS OF THE ENVIRONMENTAL PROTECTION AGENCY.

2. WHEN GIVEN THE FERTILIZER PLANS (KINDS AND AMOUNTS) FOR A FIELD, AND THE CROP TO BE GROWN, DETERMINE TO WHAT EXTENT TOXIC CONDITIONS (SYSTEMIC) MAY OCCUR IN THE PLANTS THAT MAY CAUSE HARMFUL EFFECTS TO LIVESTOCK AND MAN, ACCORDING TO RECOMMENDATIONS OF NUTRITIONISTS.

B. INSTRUCTIONAL AREAS

1. DETERMINING FERTILIZER MATERIALS THAT CAUSE ENVIRONMENTAL PROBLEMS

   A. DETERMINING EXTENT OF LEACHING INTO LAKES AND STREAMS

   B. DETERMINING AMOUNT CARRIED BY SOIL PARTICLES THROUGH SOIL EROSION

2. SELECTION OF FERTILIZER MATERIALS THAT, WHEN THEY LEACH OR RUN-OFF FROM THE SOIL, CAUSE ENVIRONMENTAL PROBLEMS

   A. FERTILIZING UNDESIRABLE AQUATIC PLANTS IN LAKES, PONDS AND STREAMS

   B. DETERMINING THE EXTENT TO WHICH FERTILIZERS CAUSE TOXIC CONDITIONS IN WATER SUPPLIES

3. DETERMINING SOIL TYPES AND TOPOGRAPHIC CONDITIONS THAT INDUCE FERTILIZER CHEMICAL LEACHING AND LEAVE THE SOIL BY WATER RUN-OFF FROM A FIELD

4. DETERMINING FERTILIZER MATERIALS THAT MOVE INTO CROP PLANTS (SYSTEMIC) CAUSING TOXIC EFFECTS ON ANIMALS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS PREPARE A LIST OF FERTILIZER CHEMICALS THAT LEAVE TOXIC PROPERTIES.

   B. HAVE STUDENTS PREPARE A LIST OF FERTILIZER CHEMICALS THAT ARE READILY SUSPENDED IN WATER AND, THEREBY, LEACH OR ARE CARRIED AWAY ON SOIL PARTICLES BY WATER RUN-OFF.

2. A. HAVE STUDENT SELECT SOIL TYPES THAT CAUSE LEACHING READILY; ALSO SELECT TOPOGRAPHIC CONDITIONS THAT CAUSE WATER RUN-OFF.

   B. HAVE STUDENTS PREPARE A LIST OF FERTILIZER CHEMICALS THAT MAY MOVE INTO PLANT TISSUES (SYSTEMIC) CAUSING TOXIC EFFECTS WHEN ANIMALS CONSUME THE PLANTS OR PLANT PRODUCTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH THE PLANS FOR FERTILIZATION OF A CROP FIELD WITH A DESCRIPTION OF THE SOIL PROPERTIES; HAVE THEM LIST FIVE FERTILITY MATERIALS THAT MAY CAUSE ENVIRONMENTAL PROBLEMS, AND DETERMINE IF WATER RUN-OFF MAY CAUSE WATER POLLUTION OF STREAMS, PONDS OR LAKES.

2. DEVELOP A MATCHING TEXT WITH ONE COLUMN BEING THE AMOUNT OF FERTILITY MATERIALS OF A TOXIC NATURE AND THE SECOND COLUMN THE POSSIBLE TOXIC EFFECT IN PLANTS AND PLANT MATERIALS.

E. INSTRUCTIONAL MATERIALS AND EQUIPMENT

1. CHARTS SHOWING DEGREE OF WATER RUN-OFF ON SLOPING SOILS

2. SLIDES, PICTURES OR CHARTS SHOWING DEGREE OF LEACHING FOR DIFFERENT SOIL TYPES

F. EXAMPLES OF SUPPORTING REFERENCES

1. COURSON, R.L. NITRATES IN WATER SUPPLIES, FIELD CROPS AND RUMINANT NUTRITION. VAS 4050. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1970, 12 PAGES.

DISCUSSES THE MANY SOURCES OF POLLUTANTS IN OUR ENVIRONMENT AND THEIR ECOLOGICAL EFFECTS.

2. HUGHES, T.D. AND WELCH, L.F. POTENTIAL FOR FERTILIZER LEACHING. URBANA, ILLINOIS: AGRONOMY DEPARTMENT, UNIVERSITY OF ILLINOIS.

   THIS IS A LEAFLET PROVIDING RESEARCH DATA ON LEACHING OF NITROGEN, PHOSPHORUS AND POTASSIUM NUTRIENTS FROM THE SOIL.

3. FACT SHEETS (CURRENT) FROM STATE EXTENSION SERVICE.

   SOME EXAMPLES OF THESE FACT SHEETS ARE: (1) FERTILIZER USE AND THE ENVIRONMENT. ST. PAUL, MINNESOTA: EXTENSION SERVICE, UNIVERSITY OF MINNESOTA, AND (2) SPEAKING OF ENVIRONMENT: FERTILIZERS. COLUMBUS, OHIO: EXTENSION SERVICE, THE OHIO STATE UNIVERSITY.

COMBINING FERTILIZERS WITH PESTICIDES

UNIT CONCEPT: THE APPLICATION OF A FERTILIZER AND A PESTICIDE IN COMBINATION WILL SAVE APPLICATION TIME AND, THEREBY, REDUCE COSTS. THE CROP PRODUCER, IN ORDER TO DO THIS OPERATION EFFECTIVELY, MUST KNOW WHICH FERTILIZER-PESTICIDE COMBINATIONS ARE COMPATIBLE, RATES TO APPLY, TIME OF YEAR TO MAKE APPLICATIONS, AND POSSIBLE HAZARDS TO THE ENVIRONMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR A GIVEN PEST PROBLEM AND FERTILIZER RECOMMENDATION FOR A CROP, SELECT THE AMOUNTS AND KIND OF PESTICIDE AND A FERTILIZER MATERIAL THAT ARE COMPATIBLE WHEN MIXED TOGETHER, AND MEET THE REQUIREMENTS OF PEST CONTROL AND NUTRIENT NEEDS ACCORDING TO RECOMMENDATIONS OF AGRONOMISTS AND PEST CONTROL SPECIALISTS.

2. WHEN PRESENTED WITH NAMES AND AMOUNTS OF A PESTICIDE-FERTILIZER COMBINATION, DETERMINE IF THE COMBINATION MAY BE HAZARDOUS TO THE ENVIRONMENT OR THE APPLICATOR ACCORDING TO THE REGULATIONS OF THE STATE AND NATIONAL ENVIRONMENTAL PROTECTION AGENCIES.

3. WHEN GIVEN PESTICIDE AND FERTILIZER MATERIALS WITH AMOUNTS TO APPLY OF EACH FOR A CROP PRODUCTION SITUATION, DETERMINE THE MIXING AND APPLICATION PROCEDURES TO FOLLOW ACCORDING TO DIRECTIONS PROVIDED BY THE SUPPLIER OF MATERIALS OR RECOMMENDATIONS OF AGRONOMY AND PEST CONTROL SPECIALISTS.

B. INSTRUCTIONAL AREAS

1. SELECTION OF PESTICIDE-FERTILIZER COMBINATIONS
    - A. DETERMINING PEST PROBLEMS AND NUTRIENT NEEDS OF THE CROPPING SITUATION
    - B. SELECTION OF PESTICIDES
    - C. SELECTION OF FERTILITY MATERIALS
    - D. DETERMINING COMPATIBILITY OF PESTICIDE-FERTILIZER COMBINATIONS

2. CALCULATING AMOUNTS OF PESTICIDE AND FERTILIZER MATERIALS TO APPLY

   A. DETERMINING PERCENTAGE OF ACTIVE INGREDIENT OF EACH TYPE OF FERTILIZER AND PESTICIDE MATERIAL

   B. DETERMINING AMOUNT OF WATER OR OTHER CARRIER TO USE

3. SELECTION OF PESTICIDE-FERTILIZER COMBINATIONS THAT ARE NOT HAZARDOUS TO THE ENVIRONMENT AND APPLICATOR

   A. DETERMINING WHETHER THE MIXTURE CAUSES SYSTEMIC, TOXIC CONDITIONS IN THE CROP PLANTS

   B. DETERMINING LEACHING PROBLEMS

      (1) WATER POLLUTION
      (2) SOIL POLLUTION

   C. DETERMINING VOLATILE PROBLEMS

      (1) HAZARDS TO THE APPLICATOR
      (2) HAZARDS TO THE ENVIRONMENT

4. MIXING AND APPLYING PESTICIDE-FERTILIZER COMBINATIONS

   A. DETERMINING MIXING PROCEDURES

   B. DETERMINING APPLICATION PROCEDURES

      (1) AT PLANTING TIME
      (2) GROWTH STAGE OF CROP

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS PREPARE A LIST OF PROBABLE PEST PROBLEMS THEY MAY ENCOUNTER AND THAT CAN EFFECTIVELY BE CONTROLLED BY USING PESTICIDES. AFTER EACH PEST, LIST THE RECOMMENDED PESTICIDES.

   B. HAVE STUDENTS LIST THE FERTILIZER MATERIALS THEY PLAN TO USE AND THE PESTICIDES THEY PLAN TO MIX WITH THEM. HAVE THEM SELECT COMBINATIONS, INCLUDING AMOUNTS, THAT WILL MIX TOGETHER (COMPATIBLE).

2. USING THE RECOMMENDATIONS OF THE ENVIRONMENTAL PROTECTION AGENCY, INCLUDING THE LIST OF RESTRICTED MATERIALS, HAVE STUDENTS MAKE A LIST OF THOSE MATERIALS HAZARDOUS TO THE ENVIRONMENT OR APPLICATOR.

3. A. HAVE EACH STUDENT CALCULATE THE ACTUAL AMOUNT OF MATERIALS TO MIX, THE WATER OR OTHER CARRIER TO APPLY USING LABEL DIRECTIONS OR RECOMMENDATIONS OF PESTICIDE AND AGRONOMY SPECIALISTS.

   B. HAVE STUDENTS DEMONSTRATE MIXING COMPATIBLE AND NON-COMPATIBLE PESTICIDE-FERTILIZER MATERIALS.

   C. PROVIDE STUDENTS WITH EXPERIENCE IN MIXING AND APPLYING PESTICIDE-FERTILIZER COMBINATION AT A FARM OR SERVICE SUPPLY CENTER.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. FROM A LIST OF PESTICIDE-FERTILIZER COMBINATIONS, HAVE STUDENTS SELECT THOSE MATERIAL COMBINATIONS THAT ARE APPROVED FOR MIXING TOGETHER (COMPATIBLE) WITH 90% ACCURACY.

   B. PRESENT STUDENTS WITH SPECIFIC PEST AND FERTILITY PROBLEMS FOR A CROP PRODUCTION SITUATION; HAVE THEM SELECT AMOUNTS AND KINDS OF MATERIALS TO USE.

2. HAVE STUDENTS MAKE A LIST OF PESTICIDE-FERTILIZER COMBINATIONS THAT ARE HAZARDOUS TO THE ENVIRONMENT, APPLICATOR OR BOTH.

3. A. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING AMOUNTS AND KINDS OF PESTICIDE-FERTILIZER MATERIALS INCLUDING THE PERCENT OF ACTIVE INGREDIENTS IN MATERIALS. HAVE THEM CALCULATE THE ACTUAL AMOUNT OF MATERIALS TO BE MIXED AND THE AMOUNT OF WATER OR OTHER CARRIERS TO USE.

   B. WITH SPECIFIC SITUATION REGARDING MIXING AND APPLYING PESTICIDE-FERTILIZER COMBINATIONS, HAVE STUDENTS LIST THE SAFETY PRECAUTIONS TO FOLLOW.

E. INSTRUCTIONAL MATERIALS AND EQUIPMENT

1. LABELS OR SAMPLE LABELS OF PESTICIDE MATERIALS

2. OPERATOR'S MANUALS OR APPLICATION EQUIPMENT

3. SAMPLES OF PESTICIDE AND FERTILIZER MATERIALS THAT CAN BE COMBINED.

F. EXAMPLES OF SUPPORTING REFERENCES

1. ANNUAL PUBLICATIONS OF PESTICIDE AND FERTILIZER RECOMMENDATIONS.

   MANY STATES ISSUE ANNUALLY PRINTED INFORMATION REGARDING RECOMMENDATION FOR PESTICIDE USE AND THOSE THAT CAN BE MIXED WITH FERTILIZER MATERIALS. CONTACT YOUR STATE COOPERATIVE EXTENSION SERVICE OR STATE DEPARTMENT OF AGRICULTURE FOR FURTHER INFORMATION.

2. CHEMICAL COMPANIES SERVING THE LOCAL AREA ARE A GOOD SOURCE OF SPECIFIC TECHNICAL MATERIALS FOR THIS UNIT. CONTACT SHOULD BE MADE WITH THEIR SALES REPRESENTATIVES FOR SPECIFIC INFORMATION.

CONTROLLING WEEDS IN FARM CROPS

UNIT CONCEPT: WEEDS ARE "PLANTS OUT-OF-PLACE." THEY ARE ONE OF THE MOST COSTLY CROP PESTS THAT COMPETE FOR SOIL NUTRIENTS, MOSITURE, LIGHT, AND CARBON DIOXIDE. CONTROLLING WEEDS IN CROPS CONTRIBUTES TO PROFITABLE FARMING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SITUATION OF A WEEDY FIELD, IDENTIFY THE MAJOR WEEDS COMMON TO THE AREA, AND DESCRIBE WELL ENOUGH TO CLASSIFY THEM ACCORDING TO REPRODUCTIVE CHARACTERISTICS AS WELL AS TYPE AND DEGREE OF HARMFUL EFFECTS.
2. WHEN GIVEN A GRAIN SAMPLE CONTAINING WEED SEEDS, CORRECTLY IDENTIFY THE COMMON NOXIOUS SEEDS TO THE SATISFACTION OF THE TEACHER.
3. WHEN GIVEN A SPECIFIC WEED PROBLEM AND CROP ROTATION PLAN, OUTLINE AND RECOMMEND AN EFFECTIVE BIOLOGICAL, CULTURAL OR CHEMICAL CONTROL PROGRAM WHICH WILL CONTROL ANTICIPATED WEED PROBLEMS TO THE SATISFACTION OF THE TEACHER.
4. WHEN GIVEN A WEED SPRAYER OR APPLICATOR, CALIBRATE AND APPLY THE RECOMMENDED RATE OF MATERIAL IN AN EVEN COVERAGE OVER THE AREA OR PLANTS TO BE TREATED; CLEAN AND STORE THE EQUIPMENT ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

B. INSTRUCTIONAL AREAS

1. REDUCING THE COST OF WEEDS

   A. DETERMINING TYPES OF LOSSES

      (1) INCREASED COST OF PRODUCTION
      (2) REDUCTION IN YIELDS
      (3) HIGHER LABOR AND EQUIPMENT COST
      (4) REDUCTION IN QUALITY OF CROPS AND CROP PRODUCTS
      (5) LOSS OF ANIMALS DUE TO POISONOUS PLANTS
      (6) REDUCED LAND VALUES
      (7) CLOGGING OF WATERWAYS AND IRRIGATION DITCHES

- (8) UNDERMINING OF ROADWAYS AND STRUCTURES
- (9) DETRACTS FROM AESTHETIC VALUE OF LANDSCAPE
- (10) FIRE HAZARDS
- (11) HARBOR PESTS AND PLANT DISEASES
- (12) DISCOMFORT TO HUMANS AND HEALTH PROBLEMS
- (13) REDUCTION IN QUALITY OF ANIMAL PRODUCTS

2. IDENTIFYING GROWING HABITS, PROPAGATION, AND MEANS OF SPREAD

A. CLASSIFYING WEEDS TO DETERMINE CONTROL PRACTICES

- (1) ANNUALS
  - (A) SUMMER ANNUALS
  - (B) WINTER ANNUALS
- (2) BIENNIALS
- (3) PERENNIALS

B. IDENTIFYING PARTS CAPABLE OF PRODUCING WEED INFESTATION

- (1) SEED
- (2) ROOTS
- (3) STEMS (RHIZOMES, STOLONS, TUBERS)
- (4) LEAVES
- (5) BULBS (WILD GARLIC AND ONION)

C. ANALYZING WAYS WEEDS SPREAD

- (1) MAN
  - (A) ADULTERATED CROP SEEDS AND CROP PRODUCTS
  - (B) FARM TILLAGE AND HARVESTING EQUIPMENT
- (2) ANIMALS
  - (A) WEED SEEDS WITH BARBS
  - (B) ANIMAL FEEDS
- (3) WIND
- (4) WATER
- (5) FILL DIRT

3. IDENTIFYING WEEDS

A. FAMILY AND NAME

B. FLOWER COLOR AND SHAPE

C. LEAF ARRANGEMENT AND SHAPE

D. TYPE OF GROWTH

E. VEGETATIVE CHARACTERISTICS

F. SEED

G. HABITAT

4. EVALUATING METHODS OF WEED CONTROL

A. CONTROLLING WEEDS BY CULTURAL PRACTICES

(1) PLANTING WEED-FREE CROP SEED
(2) TILLAGE SYSTEMS
(3) CULTIVATION
(4) MOWING
(5) CROP COMPETITION
(6) CROP ROTATIONS OR CROPPING SYSTEM
(7) MULCHING
(8) FLOODING
(9) FLAMING
(10) SMOTHERING

B. CONTROLLING WEEDS BIOLOGICALLY

(1) INSECTS
(2) DISEASES
(3) SPECIES CONTROLLED

C. CONTROLLING WEEDS BY USING CHEMICALS

(1) SELECTING THE TYPE OF CHEMICAL TO USE

(A) CONTACT (SELECTIVE AND NONSELECTIVE)
(B) GROWTH REGULATORS
(C) SOIL STERILANTS

(2) DETERMINING THE TIME OF APPLICATION

(A) PREPLANT
(B) PRE-EMERGENCE
(C) POST-EMERGENCE

(3) EVALUATING METHODS OF APPLICATION

(A) BAND
(B) BROADCAST
(C) DIRECTED SPRAYS

(4) DETERMINING THE FACTORS THAT AFFECT APPLICATION

(A) STAGE OF WEED GROWTH
(B) SOIL TYPE, ORGANIC MATTER CONTENT, AND CONDITION
(C) RAINFALL
(D) TEMPERATURE

(5) SELECTING RATES FOR SPECIFIC CROPS
(6) DETERMINING COSTS AND RETURNS
(7) CALIBRATING EQUIPMENT
(8) HANDLING AND USING CHEMICALS SAFELY

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. STUDY THE GROWTH HABITS AND IDENTIFYING CHARACTERISTICS OF THE VARIOUS PLANT AND WEED FAMILIES. STUDY HERBARIUM SPECIMENS AND MAKE A COLLECTION.

2. IDENTIFY NOXIOUS WEEDS AND WEED SEEDS COMMON TO THE LOCAL AREA AND HAVE STUDENTS DETERMINE THE MOST EFFECTIVE CONTROL PROCEDURES.

3. A. SURVEY THE WEED CONTROL PROBLEMS AND CULTURAL PRACTICES OF THE LOCAL FARM COMMUNITY.

   B. APPLY BIOLOGICAL OR CHEMICAL PRACTICES TO SELECTED WEED CONTROL PLOTS AND THEN COMPARE THE EFFECTIVENESS OF EACH IN TERMS OF COST, TIME, AND EFFORT.

   C. STUDY HERBICIDE LABELS AND CURRENT UNIVERSITY RECOMMENDED WEED CONTROL GUIDES AND DETERMINE SAFETY PRECAUTIONS.

4. A. STUDY AND CALIBRATE WEED CONTROL EQUIPMENT.

   B. STUDY AND OBSERVE HERBICIDAL APPLICATIONS. MAINTAIN A NOTEBOOK GIVING DATES OF APPLICATION, CHEMICALS USED, RATES OF APPLICATION, AND RESULTS OBTAINED.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS MATCH PICTURES OR ACTUAL SPECIMENS OF COMMON WEEDS WITH A LIST OF THEIR COMMON NAMES WITH 95% ACCURACY.

2. USING A DISPLAY OF WEED SEEDS, HAVE STUDENTS IDENTIFY THOSE THAT ARE NOXIOUS WITH 95% ACCURACY.

3. HAVE STUDENTS CORRECTLY MATCH A LIST OF COMMON WEEDS WITH RECOMMENDED CHEMICAL, BIOLOGICAL, OR CULTURAL METHODS OF CONTROL.

4. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO CALIBRATE A SPRAYER OR APPLICATOR ACCORDING TO SPECIFICATIONS IN THE OPERATOR'S MANUAL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SEEDS, PLANT SPECIMENS, SLIDES, FILMSTRIPS OR PICTURES OF WEEDS AND CROPS. AVAILABILITY OF TEACHING MATERIALS AND AIDS MAY BE FOUND IN CURRICULUM MATERIAL GUIDES AND CATALOGS.

2. REFERENCES OUTLINING CONTROL MEASURES AND FACTS ABOUT WEEDS

3. LABELS FROM VARIOUS HERBICIDE CONTAINERS

4. EQUIPMENT FOR PRACTICE CALIBRATION AND APPLICATION

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRONOMY GUIDES OR HANDBOOKS ARE PUBLISHED PERIODICALLY FROM MANY OF THE LAND GRANT UNIVERSITIES WHICH CONTAIN SECTIONS ON WEED CONTROL WHICH ARE QUITE HELPFUL WITH THIS UNIT.

2. COOPERATIVE EXTENSION SERVICES AND U.S. DEPARTMENT OF AGRICULTURE HAVE BULLETINS CONTAINING CURRENT INFORMATION ON THE LATEST WEED CONTROL TECHNIQUES AND PROCEDURES.

3. WEED CONTROL - CULTURAL AND CHEMICAL. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1969.

   A COMPREHENSIVE REFERENCE UNIT FOR ALL TYPES OF WEED CONTROL PRACTICES AND PROCEDURES WRITTEN FOR STUDENT USE.

CONTROLLING DISEASES IN FARM CROPS

UNIT CONCEPT: PLANT DISEASES MAY ASSUME EPIDEMIC IMPORTANCE, SPREAD RAPIDLY, AND UNDER CONDITIONS FAVORING THE DISEASE, GREATLY REDUCE YIELD AS WELL AS LOWER THE QUALITY OF THE CROP PRODUCED. LOSSES DUE TO DISEASE NOT ONLY AFFECT THE PRODUCER, BUT ALSO THE CONSUMER. MOST DISEASES ARE EXPENSIVE TO CONTROL AND THE ADDED COST IS REFLECTED IN HIGHER PRICES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. USING LIVE PLANTS, PRESERVED SPECIMENS OF PLANTS, OR COLORED PHOTOGRAPHS OF PLANTS AFFECTED WITH DISEASES COMMON IN THE LOCAL AREA, IDENTIFY THE DISEASES.
2. FOR DISEASES OF CROPS IN THE AREA EXPLAIN THE RECOMMENDED PROCEDURES TO PREVENT OR KEEP DISEASES IN CHECK.
3. GIVEN A FIELD OF GROWING CROPS WITH DISEASE DAMAGE, DETERMINE IF THE PROBLEM IS BAD ENOUGH TO WARRANT CHEMICAL OR BIOLOGICAL CONTROL MEASURES.
4. GIVEN A CHEMICAL SPRAYER OR DUSTER, SAFELY CALIBRATE, APPLY, CLEAN AND THEN STORE THE EQUIPMENT ACCORDING TO RECOMMENDED PROCEDURES OUTLINED IN THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE SYMPTOMS OF PLANT DISEASES
    - A. VISIBLE DISEASE SYMPTOMS
        - (1) COLOR
        - (2) PHYSICAL DAMAGE
    - B. PATHOGEN'S LIFE CYCLE
    - C. TIME OF INFECTION
    - D. PARTS OF THE PLANT AFFECTED

- (1) LEAVES OR FOLIAGE
- (2) STEMS
- (3) FLOWERS AND FRUIT
- (4) ROOTS OR UNDERGROUND PARTS

E. RELATIVE RESISTANCE OR SUSCEPTIBILITY OF THE HOST PLANT

2. RECOGNIZING THE CAUSES OF PLANT DISEASES

A. BACTERIA

B. FUNGI

C. VIRUSES

D. NEMATODES

E. OTHER CAUSES (NONPARASITIC OR NONINFECTIOUS)

- (1) MINERAL DEFICIENCIES OR TOXICITIES
- (2) MECHANICAL INJURY
- (3) CHEMICAL INJURIES
- (4) INSECT INJURIES
- (5) LIGHTNING OR OTHER CLIMATIC INJURIES
- (6) ABNORMALITIES CAUSED BY GENETIC DISTURBANCES IN THE PLANT ITSELF

3. FACTORS AFFECTING DISEASE DEVELOPMENT

A. DETERMINING FAVORABLE GROWING CONDITIONS

- (1) AMOUNT AND FREQUENCY OF RAIN OR HEAVY DEWS
- (2) RELATIVE HUMIDITY
- (3) AIR AND SOIL TEMPERATURE
- (4) PLANT NUTRITION

B. DETERMINING METHODS OF SPREADING

- (1) INSECTS AND OTHER ANIMAL LIFE
- (2) WATER
- (3) WIND
- (4) WEEDS
- (5) MECHANICAL MEANS

4. CONTROLLING PLANT DISEASES

A. SELECTING RESISTANT VARIETIES

B. USING DISEASE-FREE SEED OR PLANTING STOCK

C. TREATING THE SEED FOR SOIL-BORN DISEASES

D. USING ROTATIONS OR CROPPING SYSTEMS

E. FUMIGATING THE SOIL

F. CONTROLLING WEEDS, INSECTS, MITES, AND RODENTS WHICH HARBOR AND SPREAD DISEASES

G. OBSERVING QUARANTINE REGULATIONS

H. STORING PROCEDURE

I. APPLYING PROTECTIVE FUNGICIDES

(1) USING RECOMMENDED KINDS AND AMOUNTS OF THE CHEMICAL
(2) INTERPRETING PRECAUTIONS AND HAZARDS TO HANDLER
(3) FOLLOWING LABEL RESTRICTIONS
(4) CALIBRATING EQUIPMENT PROPERLY
(5) OBTAINING FULL COVERAGE OF SEED OR PLANT SURFACES
(6) RECORDING APPLICATION RATES AND SCHEDULES

5. DETERMINING WHEN CONTROL MEASURES ARE NECESSARY

A. ESTIMATING THE PROPORTION OF THE CROP AFFECTED

B. ESTIMATING THE ECONOMIC LOSSES TO BE EXPECTED IF CONTROL MEASURES ARE NOT USED

C. ESTIMATING COSTS OF THE CONTROL MEASURES

D. DEFINING THE BENEFITS WHICH CAN BE ACHIEVED BY THE CONTROL MEASURES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USING REFERENCES THAT DESCRIBE DISEASES IN THE LOCAL AREA, HAVE STUDENTS IDENTIFY THE CAUSE AND RECOMMENDED CONTROL MEASURES FOR VARIOUS PLANT SPECIMENS OR SLIDES OF DISEASED PLANT MATERIAL. USE PREPARED MICROSCOPE SLIDES FOR ACTUAL OBSERVATION OF THE ORGANISMS.

2. HAVE STUDENTS VISIT LOCAL AGRICULTURAL AUTHORITIES AND ASK THEM FOR INFORMATION ON DISEASE CONTROL, PESTICIDE USAGE, PRECAUTIONS IN USE, AND RESULTS EXPECTED. KEEP CURRENT COPIES OF PESTICIDE SUGGESTIONS.

3. SHOW SLIDES OR PICTURES OF DISEASED CROPS IN VARIOUS STAGES AND HAVE STUDENTS DETERMINE IF BIOLOGICAL OR CHEMICAL CONTROL MEASURES ARE NECESSARY.

4. A. IF AVAILABLE, ADJUST AND CALIBRATE SPRAY AND DUST EQUIPMENT USED FOR DISEASE CONTROL.

   B. MAINTAIN A NOTEBOOK GIVING DATES OF APPLICATION, CHEMICAL USED, THE PERCENTAGE OF ACTIVE INGREDIENTS, DILUTIONS, RATES OF APPLICATION PER ACRE, AND ANY SPECIAL REMARKS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST USING SLIDES, PICTURES OR PRESERVED SPECIMENS OF PLANTS AFFECTED WITH DISEASE AND HAVE STUDENTS MATCH THE VISUALS WITH A LIST OF DISEASE NAMES. PERFORMANCE SHOULD BE WITH 90% ACCURACY.

2. GIVE STUDENTS A LIST OF CHEMICALS USED TO CONTROL COMMON CROP DISEASES AND HAVE THEM DETERMINE TWO DISEASES THE GIVEN CHEMICALS CAN BE USED WITH FOR CONTROL.

3. SHOW SLIDES OF CROP DISEASES IN VARIOUS STAGES AND HAVE STUDENTS MAKE A JUDGEMENT AS TO THE FEASIBILITY OF USING CHEMICAL METHODS OF CONTROL. THIS EXERCISE SHOULD BE ACCOMPLISHED WITH 95% ACCURACY.

4. HAVE EACH STUDENT CALIBRATE A CHEMICAL SPRAYER OR APPLICATOR ACCORDING TO THE SPECIFICATIONS OF THE OPERATOR'S MANUAL WITH 95% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. DISEASE SPECIMENS, SLIDES, FILMSTRIPS, OR PICTURES OF DISEASED CROPS AND PLANT PARTS.

2. PREPARED MICROSCOPE SLIDES OF DISEASE ORGANISMS

3. REFERENCES OUTLINING CONTROL MEASURES AND FACTS ABOUT DISEASES

4. LABELS FROM PESTICIDE CONTAINERS

5. EQUIPMENT FOR PRACTICE CALIBRATION AND APPLICATION

F. EXAMPLES OF SUPPORTING REFERENCES

1. ALDRICH, SAMUEL R. AND LENG, EARL R. MODERN CORN PRODUCTION. CINCINNATI, OHIO: F & W PUBLISHING COMPANY. PP. 205-260.

THIS TEXT CONTAINS GOOD COLOR PHOTOGRAPHS OF THE CORN DISEASES. IT INCLUDES DESCRIPTIONS OF THE DISEASES, THE EFFECTS ON THE PLANT, WHEN AND HOW THE SYMPTOMS APPEAR, WAYS THE DISEASES ARE SPREAD, AND RECOMMENDED TREATMENT OR CONTROL.

2. SHURLEFF, M.C. HOW TO CONTROL PLANT DISEASES IN HOME AND GARDEN. AMES, IOWA: IOWA STATE UNIVERSITY PRESS. 1966.

   INCLUDES ILLUSTRATIONS AND CONTROL PROCEDURES FOR COMMON CROP DISEASES.

3. SOYBEAN DISEASES. PM-528. AMES, IOWA: IOWA STATE UNIVERSITY, COOPERATIVE EXTENSION SERVICE. 1972.

   INCLUDES PICTURES OF DISEASED PLANTS AS WELL AS RECOMMENDED CONTROL PROCEDURES.

4. STATE DEPARTMENT OF AGRICULTURE PUBLICATIONS AND COOPERATIVE EXTENSION BULLETINS SHOULD BE ACQUIRED THAT DEAL WITH DISEASES IN THE LOCAL AREA.

CONTROLLING INSECTS IN FARM CROPS

UNIT CONCEPT: EVERY MINUTE OF THE DAY AND NIGHT BILLIONS OF INSECTS ARE CHEWING, SUCKING, BITING, AND BORING AWAY AT OUR CROPS. THEY CAUSE LOSSES IN MANY WAYS. INCREASES IN YIELD PER ACRE AND MARKET VALUE OF CROPS HAVE RAISED THE PERMISSIBLE LIMIT ON EXPENDITURES FOR THE CONTROL OF INSECTS. INSECTICIDES WILL CONTINUE TO PLAY THE MAJOR ROLE IN CONTROLLING INSECTS; HOWEVER, NEW BIOLOGICAL AND CULTURAL CONTROLS ARE ALSO BEING DEVISED AND USED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. GIVEN PLANT SPECIMENS DAMAGED BY INSECTS, RECOGNIZE THE SOURCE OF THE DAMAGE, EITHER ON SIGHT OR BY USING SELECTED REFERENCES, FOR THE INSECTS THAT COMMONLY CAUSE SIGNIFICANT ECONOMIC LOSSES IN THE AREA.

2. GIVEN LIVE INSECTS, INSECT SPECIMENS, OR COLORED SCALE PICTURES OF INSECTS FOR IDENTIFICATION, CORRECTLY IDENTIFY THE MAIN INSECTS THAT ATTACK THE MAJOR CROPS GROWN IN THE AREA.

3. GIVEN SPECIFIC INSECT PROBLEMS, DETERMINE RECOMMENDED BIOLOGICAL AND CULTURAL METHODS OF CONTROL THAT ARE PRACTICAL TO USE FOR EACH INSECT AND GROWING CROP ACCORDING TO CURRENT REFERENCE MATERIALS.

4. GIVEN VARIOUS INSECTICIDES, INTERPRET THE INFORMATION INCLUDED ON THE LABEL, DETERMINE THE APPLICATION RATE, AND DEMONSTRATE SAFETY PRECAUTIONS AND KNOW LEGAL RESTRICTIONS FOR ITS USE.

5. GIVEN PROPER EQUIPMENT FOR USE WITH THE VARIOUS METHODS OF CONTROL, SAFELY PREPARE, OPERATE, CALIBRATE OR ADJUST, CLEAN, AND STORE EQUIPMENT IN AN APPROVED MANNER.

B. INSTRUCTIONAL AREAS

1. SURVEYING THE CROP TO DETERMINE THE STATUS OF INSECT INFESTATIONS

A. IDENTIFYING BENEFICIAL AND HARMFUL INSECTS

B. ESTIMATING INSECT POPULATIONS

C. RECOGNIZING DAMAGE DONE BY DIFFERENT INSECT SPECIES

D. DETERMINING EXTENT OF DAMAGE AND POSSIBLE INCOME LOSS

E. COMPARING THE COST OF CONTROL TO THE LOSS IF IT IS NEGLECTED

F. DETERMINING IF CONTROL MEASURES ARE NECESSARY

2. IDENTIFYING THE SPECIFIC INSECT(S) THAT NEED TO BE CONTROLLED

A. IDENTIFYING CHARACTERISTICS AND DESCRIPTIONS

B. DETERMINING DEVELOPMENT AND LIFE CYCLE

C. IDENTIFYING THE BEST TIME IN THE LIFE CYCLE TO APPLY CONTROL

D. COLLECTING AND MOUNTING INSECTS

3. SELECTING SOUND INSECT CONTROL PROGRAMS

A. CONTROLLING INSECTS WITH CULTURAL PRACTICES

(1) SELECTING ROTATIONS OR CROPPING SYSTEMS
(2) USING CLEAN CULTURE OR DESTROYING CROP DEBRIS

B. DETERMINING NATURAL INSECT ENEMIES

(1) USING CLIMATIC FACTORS TO REDUCE INSECT BUILD-UP
(2) CONTROLLING INSECTS BY NATURAL ENEMIES - BIRDS, DISEASE ORGANISMS, PREDATORY, BENEFICIAL, AND PARASITIS INSECTS

C. EVALUATING QUARANTINE PRACTICES

D. REDUCING INFESTATIONS BY BIOLOGICAL MEANS

(1) SELECTING PREDATOR OR PARASITIC INSECTS
(2) USING RESISTANT CROP VARIETIES

    - (3) EVALUATING DISEASE ORGANISMS
    - (4) DETERMINING POSSIBLE USE OF INSECT STERILIZATION

  - E. USING INSECTICIDES TO CONTROL LARGE INSECT INFESTATIONS

    - (1) FORMULATING AND MIXING INSECTICIDES
    - (2) CLASSIFYING INSECTICIDES ACCORDING TO MODE OF ENTRY INTO INSECT'S BODY

      - (A) STOMACH POISONS - EATEN
      - (B) CONTACT POISONS - SKIN
      - (C) FUMIGANTS - BREATHING TUBES OR SKIN

    - (3) CLASSIFYING INSECTICIDES ACCORDING TO THEIR CHEMICAL NATURE
    - (4) DETERMINING RIGHT TIME, PROPER RATE, AND CORRECT FORM TO GAIN MAXIMUM EFFECTIVENESS
    - (5) DETERMINING COSTS AND POSSIBLE RETURNS FOR INSECTICIDE USE
    - (6) CALIBRATING EQUIPMENT
    - (7) FOLLOWING CONTAINER DIRECTIONS, LABEL RESTRICTIONS, AND SAFE HANDLING PRACTICES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. STUDY THE LIFE CYCLES AND IDENTIFYING CHARACTERISTICS OF THE INSECTS AND THEIR ORDERS. EXAMINE INSECT COLLECTIONS AND MAKE ONE OF YOUR OWN.

2. A. STUDY ACTUAL SPECIMENS USING A GRASSHOPPER AS A TYPICAL INSECT, AND DISSECT AND LABEL PARTS. STUDY THE VARIOUS MOUTHPARTS UNDER THE MICROSCOPE.

   B. HAVE STUDENTS BRING IN CROPS THAT HAVE BEEN DAMAGED BY INSECTS AND, USING REFERENCES HAVE THEM IDENTIFY THE INSECT THAT CAUSED THE DAMAGE.

3. A. SURVEY THE INSECT CONTROL PROBLEMS OF THE LOCAL FARM COMMUNITY AND DETERMINE CONTROL PROCEDURES TO USE TO CORRECT THE PROBLEMS.

   B. SELECT THE MOST EFFECTIVE INSECTICIDE TO USE FOR EACH INSECT STUDIED BY REFERRING TO THE LATEST CONTROL INFORMATION AVAILABLE ON THE SUBJECT.

4. MAINTAIN A NOTEBOOK GIVING DATES OF APPLICATION, CHEMICAL USED, RATES OF APPLICATION, AND RESULTS OBTAINED.

5. ADJUST AND CALIBRATE EQUIPMENT USED FOR INSECT CONTROL ACCORDING TO OPERATOR'S MANUALS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. SHOW STUDENTS PLANT SPECIMENS DAMAGED BY COMMON INSECTS AND HAVE THEM IDENTIFY THE INSECT(S) CAUSING THE DAMAGE WITH 95% ACCURACY.

2. USE SLIDES, PICTURES OR PRESERVED INSECT SPECIMENS, AND HAVE STUDENTS MATCH THE INSECTS WITH THEIR COMMON NAME WITH 95% ACCURACY.

3. FOR THE MOST COMMON INSECTS IN THE LOCAL AREA, HAVE STUDENTS DESCRIBE THE MOST EFFECTIVE CONTROL METHOD TO USE ACCORDING TO RECOGNIZED CURRENT REFERENCES. THIS EXERCISE SHOULD BE ACCOMPLISHED WITH 95% ACCURACY.

4. GIVE STUDENTS LABELS FROM VARIOUS INSECTICIDES AND HAVE THEM CORRECTLY DETERMINE THE APPLICATION RATE FOR A SPECIFIC SIZE FIELD AND CROP.

5. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO CALIBRATE SPRAYERS OR APPLICATORS ACCORDING TO MANUFACTURERS RECOMMENDATIONS. PERFORMANCE SHOULD BE AT THE 95% LEVEL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. INSECT COLLECTIONS, SLIDES, FILMSTRIPS, OR PICTURES OF INSECTS AND DAMAGED CROPS.

2. MICROSCOPES, SLIDES, AND DISSECTING EQUIPMENT

3. REFERENCES OUTLINING CONTROL MEASURES AND FACTS ABOUT INSECTS

4. LABELS FROM VARIOUS INSECTICIDE CONTAINERS AND PACKAGES

5. EQUIPMENT FOR PRACTICE CALIBRATION AND APPLICATION

F. EXAMPLES OF SUPPORTING REFERENCES

1. INSECT PESTS OF FIELD CROPS AND STORED GRAINS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1973.

   A COMPREHENSIVE REFERENCE WITH ILLUSTRATIONS OF COMMON INSECT PESTS PLUS RECOMMENDED CONTROL TECHNIQUES AND PROCEDURES.

2. STATE DEPARTMENT OF AGRICULTURE PUBLICATIONS AND COOPERATIVE EXTENSION BULLETINS SHOULD BE ACQUIRED THAT DEAL WITH INSECTS IN THE LOCAL AREA. THESE SHOULD ALSO CONTAIN INFORMATION ABOUT THE LEGAL RESTRICTIONS AND RECOMMENDATIONS TO USE FOR CONTROLLING THESE PESTS.

SAFE USE OF PEST CONTROL CHECMICALS

UNIT CONCEPT: PESTICIDES CAN BE VERY BENEFICIAL FOR CONTROLLING PESTS, IF USED PROPERLY; HOWEVER, PROFICIENCY MUST BE DEVELOPED WHEN HANDLING, MIXING AND STORING PEST CONTROL CHEMICALS IN ORDER TO PREVENT THE HARMFUL EFFECTS ON HUMANS, ANIMALS AND OTHER PLANT LIFE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN LABELS FROM VARIOUS COMMONLY USED PESTICIDES, DETERMINE TYPE OF PEST(S) THAT THE PESTICIDE IS DESIGNED TO CONTROL.

2. WHEN GIVEN VARIOUS COMMONLY USED PESTICIDES, DEMONSTRATE THE RECOMMENDED PROCEDURE AND SAFETY PRECAUTIONS FOR HANDLING AND MIXING PESTICIDES.

3. WHEN GIVEN VARIOUS PESTICIDES READY FOR APPLICATION, DEMONSTRATE THE PROCEDURES FOR SAFE APPLICATION OF PESTICIDES.

4. WHEN GIVEN SURPLUS PESTICIDES AND CONTAINER, DEMONSTRATE THE PROCEDURE FOR SAFE DISPOSAL AND STORAGE OF PESTICIDES.

5. WHEN GIVEN VARIOUS COMMONLY USED PESTICIDES, DETERMINE AND FOLLOW LEGAL RESTRICTIONS AS THEY PERTAIN TO THE HANDLING, MIXING, STORAGE AND DISPOSAL OF PESTICIDES.

B. INSTRUCTIONAL AREAS

1. CLASSIFYING PESTICIDES

   A. IDENTIFYING TYPE OF PEST TO BE CONTROLLED BY PESTICIDE

   B. CLASSIFYING ACCORDING TO PESTICIDE METHOD OF CONTROL

      (1) CONTACT
      (2) STOMACH
      (3) SYSTEMIC

   C. CLASSIFYING ACCORDING TO TYPE OF FORMULATION

2. HANDLING AND MIXING PESTICIDES SAFELY
    - A. FOLLOWING LABEL DIRECTIONS FOR PROPER AND SAFE HANDLING
    - B. DETERMINING IF PROTECTIVE CLOTHING IS NEEDED
    - C. DETERMINING LEGAL RESTRICTIONS FOR HANDLING AND MIXING PESTICIDES
    - D. FOLLOWING SAFETY PRECAUTIONS WHEN MIXING PESTICIDES
3. APPLYING PESTICIDES ACCURATELY AND SAFELY
    - A. DETERMINING APPLICATION RATES
    - B. CONSIDERING ENVIRONMENTAL CONDITIONS IN RELATION TO APPLICATION (WIND)
    - C. CALIBRATING APPLICATION EQUIPMENT ACCURATELY
    - D. LEGAL RESTRICTIONS TO BE FOLLOWED IN APPLYING PESTICIDES
    - E. FOLLOWING RECOMMENDED PROCEDURES FOR ACCURATE AND SAFE APPLICATION
    - F. CLEANING EQUIPMENT ACCORDING TO LABEL AND MANUFACTURER'S RECOMMENDATIONS
4. DISPOSING OF SURPLUS PESTICIDES AND CONTAINERS
    - A. NEUTRALIZING POISONOUS EFFECTS
    - B. BURYING SURPLUS PESTICIDES AND CONTAINERS
    - C. DISPOSING OF EMPTY CONTAINERS
    - D. AVOIDING PESTICIDE CONTACT DURING DISPOSAL
    - E. WASHING LARGE CONTAINERS
5. STORING PESTICIDES
    - A. DETERMINING POSSIBLE CONSEQUENCES OF IMPROPER STORAGE
    - B. PROVIDING PROPER STORAGE CONDITIONS
    - C. AFFIXING LOOSE LABELS ON CONTAINERS
    - D. DISCARDING OUTDATED AND UNIDENTIFIED CONTAINERS AND MATERIALS

E. EXAMINING CONTAINERS PERIODICALLY FOR LEAKS AND TEARS

F. PRECAUTIONS AGAINST POTENTIAL FIRE HAZARDS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. OBTAIN A LIST OF COMMONLY USED PESTICIDES AND SUFFICIENT REFERENCES AND HAVE STUDENTS MAKE A CHART FOR FUTURE USE WHICH DETAILS THE NAME OF THE PESTICIDES, TYPE, CHEMICAL NATURE OR SOURCE, AVAILABLE FORMULATIONS, CROPS WHERE COMMONLY USED AND TYPE OF PEST CONTROLLED.

2. USING VARIOUS PESTICIDE LABELS, HAVE STUDENTS GIVE ALL PRECAUTIONARY MEASURES TO BE OBSERVED WHEN USING A PARTICULAR SUBSTANCE.

3. A. DEPENDING ON TYPE OF EQUIPMENT AVAILABLE, HAVE STUDENTS DEMONSTRATE THE SAFEST PROCEDURE TO FOLLOW WHEN USING PARTICULAR PESTICIDES. EACH STUDENT SHOULD PERFORM THIS TASK WITH AT LEAST THREE DIFFERENT KINDS OF PESTICIDES.

   B. STUDENT CAN DEMONSTRATE PROPER CLEANING PROCEDURES FOR AVAILABLE SPRAYERS.

   C. STUDENTS SHOULD CALIBRATE EQUIPMENT TO ACHIEVE MOST EFFECTIVE AND SAFEST APPLICATION OF PEST CONTROL CHEMICALS.

4. A. HAVE STUDENTS MAKE SAFETY SURVEY OR CHECK AT HOME FOR POSSIBLE HAZARDOUS CONDITIONS RELATING TO PESTICIDE STORAGE.

   B. STUDENTS MAY DISPOSE OF EMPTY CONTAINERS FOLLOWING RECOMMENDED PROCEDURES.

5. WITH THE MOST COMMONLY USED PESTICIDES, HAVE STUDENTS DETERMINE AND LIST ANY LICENSES, PERMITS OR OTHER LEGAL RESTRICTIONS AS THEY PERTAIN TO THE ACQUISITION, HANDLING, MIXING, APPLICATION OR STORAGE OF THE PESTICIDES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST OR EXERCISE WHICH LISTS THE TYPE OF PESTICIDE IN ONE COLUMN AND THE PEST TO BE CONTROLLED IN THE OTHER AND HAVE STUDENTS MATCH THE PROPER PEST WITH THE TYPE OF PESTICIDE WITH COMPLETE ACCURACY.

2. WITH PESTICIDE LABELS OR SIMILAR INFORMATION, THE STUDENT SHOULD BE ABLE TO DETERMINE, DESCRIBE OR DEMONSTRATE THE RECOMMENDED PROCEDURE FOR MIXING THE PARTICULAR PESTICIDE FOR A SPECIFIC CROP WITH COMPLETE ACCURACY.

3. EACH STUDENT SHOULD LIST AND EXPLAIN THE SAFETY PRECAUTIONS ONE MUST FOLLOW WHEN APPLYING CHEMICALS TO CONTROL PESTS. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) READING LABEL DIRECTIONS, (2) WEARING PROTECTIVE CLOTHING, (3) CONSIDERING ENVIRONMENTAL CONDITIONS, AND (4) PROPER CLEANING PROCEDURES FOR SAFETY.

4. WHEN GIVEN A LIST OF TYPES OF CONTAINERS AND SURPLUS PESTICIDES, THE STUDENT SHOULD DESCRIBE IN WRITING OR ORALLY WITH COMPLETE ACCURACY THE RECOMMENDED PROCEDURE FOR SAFE DISPOSAL OR STORAGE OF THE LISTED ITEMS. THESE PRECAUTIONS WILL VARY ACCORDING TO TYPE OF PESTICIDES AS WELL AS TYPE AND SIZE OF CONTAINER.

5. STUDENTS SHOULD BE ABLE TO DETERMINE THE LEGAL RESTRICTIONS FOR SPECIFIC PESTICIDE MATERIALS FOR THE PARTICULAR STATE OR LOCAL AREA. THEY SHOULD ALSO BE ABLE TO EXPLAIN WHY A PESTICIDE MAY BE RESTRICTED. THEIR EXPLANATION SHOULD INCLUDE: (1) HIGH RESIDUAL ACTION, (2) TOXICITY TO HUMANS OR OTHER WARM-BLOODED ANIMALS, AND (3) POSIONOUS TO POLLINATING INSECTS, BIRDS OR OTHER WILDLIFE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. LABELS FROM VARIOUS PESTICIDE CONTAINERS
2. SPRAYERS - IF LARGE TANK SPRAYERS ARE NOT AVAILABLE, THE BASIC SAFETY PROCEDURES CAN BE FOLLOWED USING HAND SPRAYERS
3. VARIOUS PESTICIDES COMMONLY USED IN LOCAL AREA
4. LAWS OR OTHER LEGAL PAPERS PERTAINING TO PESTICIDES USED IN LOCAL AREA

F. EXAMPLES OF SUPPORTING REFERENCES

1. INSECTICIDES. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1973, 49 PAGES.

331/1.322

AN EXCELLENT AND COMPREHENSIVE REFERENCE WHICH INCLUDES MATERIAL COVERING HOW PESTICIDES CONTROL PESTS, CHEMICAL NATURE OF INSECTICIDES, LABEL INFORMATION, LEGISLATION PERTAINING TO PESTICIDE USE, APPLICATOR STORAGE, AND DISPOSAL OF PESTICIDES.

HARVESTING FARM CROPS

UNIT CONCEPT: PROPER HARVESTING OF FARM CROPS IS A NECESSITY IF OPTIMUM RETURN IS TO BE REALIZED. THE CROP PRODUCER MUST BE ABLE TO DETERMINE WHEN TO HARVEST, THE EQUIPMENT TO USE, AND CARRY OUT RECOMMENDED PROCEDURES IF HE IS TO REALIZE THE HIGHEST POSSIBLE YIELD.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A FARM CROP TO BE HARVESTED, DETERMINE THE STAGE OF MATURITY AT WHICH THE CROP SHOULD BE HARVESTED TO REALIZE THE GREATEST YIELD IN QUALITY AND QUANTITY.
2. WHEN GIVEN A FARM CROP TO BE HARVESTED, SELECT AND CALIBRATE THE EQUIPMENT TO BE USED TO CARRY OUT THE HARVESTING OPERATION TO THE SATISFACTION OF THE TEACHER.
3. WHEN GIVEN SPECIFIC HARVESTING EQUIPMENT, SAFELY OPERATE THE EQUIPMENT SO THAT THERE IS A MINIMUM OF CROP LOSS AND PERFORM SIMPLE MAINTENANCE PROCEDURES ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

B. INSTRUCTIONAL AREAS

1. DETERMINING WHEN TO HARVEST FARM CROPS
   A. DETERMINING THE VALUE OF GOOD HARVESTING PRACTICES
   B. IDENTIFYING TYPE OF CROP TO BE HARVESTED
   C. DETERMINING STAGE OF GROWTH TO HARVEST TO ACHIEVE OPTIMUM QUALITY AND VALUE
   D. DETERMINING FACTORS OR CHARACTERISTICS OF THE CROP TO BE HARVESTED WHICH INDICATE VARIOUS GROWTH STAGES
   D. DETERMINING POTENTIAL QUALITY, QUANTITY AND VALUE LOSSES OF HARVESTING CROPS AT VARIOUS MOISTURE CONTENT LEVELS
2. SELECTING HARVESTING EQUIPMENT
   A. IDENTIFYING CROP TO BE HARVESTED

    (1) GRAIN
    (2) HAY AND FORAGE
    (3) VEGETABLES AND FRUITS
    (4) SPECIALTY CROPS

B. DETERMINING THE AMOUNT OF LAND TO BE HARVESTED AND TIME LIMITATIONS TO CONSIDER

C. DETERMINING THE FINANCIAL RESOURCES AVAILABLE, COST OF EQUIPMENT AND EXPECTED RETURNS

D. COMPARING ECONOMICS OF BUYING, RENTING OR LEASING HARVESTING EQUIPMENT

E. COMPARING ECONOMICS OF CUSTOM WORK IN HARVESTING

F. IDENTIFYING AVAILABILITY OF SERVICE OUTLETS FOR MACHINERY

G. DETERMINING THE DESIGN, EASE OF OPERATION AND ADJUSTMENT, MANEUVERABILITY AND COMFORT OF EQUIPMENT

H. DETERMINING POTENTIAL CROP LOSSES IN QUALITY AND QUANTITY FOR VARIOUS TYPES OF MACHINERY

3. OPERATING HARVESTING EQUIPMENT

A. USING THE OPERATOR'S MANUAL FOR DETERMINING PROPER EQUIPMENT OPERATION

B. PERFORMING DAILY MAINTENANCE OF EQUIPMENT

C. ATTACHING AND LUBRICATING EQUIPMENT

D. CALIBRATING AND ADJUSTING HARVESTING EQUIPMENT

E. OBSERVING SAFETY PRECAUTIONS

F. OBSERVING RECOMMENDED OPERATING SPEED

G. CHECKING FOR HARVEST LOSS OR CROP DAMAGE

    (1) LOCATING SOURCE OF LOSSES
    (2) IDENTIFYING METHODS OF DETERMINING EXTENT OF LOSSES

H. UNLOADING HARVESTED CROP

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS MAKE A CHART WHICH COMPARES THE QUALITY AND YIELD OF SPECIFIC FARM CROPS ACCORDING TO VARIOUS STAGES OF MATURITY THAT THE CROP MIGHT BE HARVESTED. BASED UPON CURRENT MARKET PRICE, THEY MIGHT ALSO FIGURE DIFFERENCES IN EXPECTED RETURNS.

2. COLLECT ADVERTISING BULLETINS OF VARIOUS TYPES OF HARVESTING EQUIPMENT AND HAVE STUDENTS COMPARE THE TYPES OF AVAILABLE EQUIPMENT ACCORDING TO SIZE, COST, MAINTENANCE NEEDED, AND THEIR INTENDED USE. THEY SHOULD ALSO CONSIDER THE ADVANTAGES AND DISADVANTAGES OF THE AVAILABLE EQUIPMENT.

3. A. HAVE STUDENTS INSPECT VARIOUS HARVESTED CROPS AND DETERMINE IF DAMAGE TO CROPS WAS DUE TO IMPROPER HARVESTING TECHNIQUES. THEY MAY ALSO DETERMINE HOW THIS DAMAGE COULD HAVE BEEN PREVENTED.

   B. HAVE STUDENTS PRACTICE HITCHING HARVESTING EQUIPMENT AND OPERATING EQUIPMENT COMMON TO THE AREA. OTHER CLASS MEMBERS CAN EVALUATE OR JUDGE HOW WELL THE STUDENT PERFORMS THESE TASKS AND MAKE RECOMMENDATIONS FOR IMPROVEMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST WHICH LISTS VARIOUS FARM CROPS IN ONE COLUMN AND STAGES OF GROWTH (1/3 BLOOM, FULL BLOOM, FULL HEADED) IN ANOTHER COLUMN AND HAVE THE STUDENTS MATCH STAGE OF GROWTH WITH THE PARTICULAR CROP WITH COMPLETE ACCURACY.

2. GIVE STUDENTS DESCRIPTIONS OF SPECIFIC HARVESTING SITUATIONS WHICH GIVE SIZE OF FIELD TO BE HARVESTED, AVAILABLE EQUIPMENT, TYPE AND AMOUNT OF CROP TO BE HARVESTED AND COST OF EQUIPMENT. HAVE STUDENTS SELECT THE EQUIPMENT THEY WOULD USE THAT WOULD DO AN EFFICIENT JOB OF HARVESTING AS WELL AS BE AN ECONOMICAL INVESTMENT. THE TEACHER SHOULD EVALUATE PERFORMANCE IN RELATION TO THE GIVEN SITUATIONS.

3. HAVE STUDENTS LIST THE SAFETY PRECAUTIONS TO OBSERVE WHEN OPERATING SPECIFIC HARVESTING EQUIPMENT BASED UPON MANUFACTURERS' RECOMMENDATIONS AND THE OPERATORS' MANUALS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR MANUALS AND ADVERTISING BULLETINS FOR VARIOUS TYPES OF HARVESTING EQUIPMENT
2. CHARTS, PICTURES AND OTHER AIDS ILLUSTRATING CROP LOSSES DUE TO VARIOUS HARVESTING TECHNIQUES
3. HAND TOOLS NECESSARY FOR CALIBRATING EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. COMBINES AND COMBINING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 105 PAGES.

   THIS REFERENCE IS DESIGNED TO ASSIST STUDENTS IN GAINING KNOWLEDGE CONCERNING THE USE AND OPERATION OF THIS MACHINE.

2. CORN PICKERS AND PICKING CORN. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 137 PAGES.

   A SIMILAR PUBLICATION TO COMBINES AND COMBINING, THIS REFERENCE DEALS WITH DESIGN, OPERATION AND PURCHASING ECONOMICS OF THIS TYPE OF HARVESTING EQUIPMENT.

DRYING FARM CROPS

UNIT CONCEPT: BECAUSE THE MOISTURE CONTENT OF FARM CROPS MAY AFFECT ITS GRADE AND QUALITY AND, THEREFORE, RETURNS, IT IS NECESSARY THAT THE CROP PRODUCER BE FAMILIAR WITH THE IMPORTANCE AND THE PRINCIPLES OF DRYING FARM CROPS IN ORDER TO REALIZE THE GREATEST PROFIT AND OPTIMUM VALUE FROM HIS EFFORTS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIC FARM CROP, DETERMINE THE MOISTURE CONTENT OF THE CROP WITHIN ± 2% THROUGH VISUAL EXAMINATION OF THE CROP OR BY USING DEVICES DESIGNED TO MEASURE MOISTURE CONTENT OF THE SPECIFIC FARM CROPS.

2. WHEN GIVEN A SPECIFIC FARM CROP TO BE DRIED AND A LIST OF AVAILABLE DRYING EQUIPMENT AND FACILITIES, SELECT THE FACILITIES AND EQUIPMENT THAT WILL PROVIDE OPTIMUM DRYING CONDITIONS FOR THE CROP.

3. WHEN GIVEN SPECIFIC DRYING FACILITIES AND EQUIPMENT FOR A SPECIFIC TYPE OF FARM CROP, OPERATE AND MAINTAIN THE SYSTEM ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

B. INSTRUCTIONAL AREAS

1. GENERAL CONSIDERATIONS OF DRYING FARM CROPS

    A. IDENTIFYING THE IMPORTANCE OF DRYING FARM CROPS

    B. IDENTIFYING FARM CROPS WHICH CAN BE DRIED UNDER NATURAL CONDITIONS

    C. IDENTIFYING FARM CROPS WHICH SHOULD BE DRIED UNDER ARTIFICIAL (MECHANICAL) CONDITIONS

    D. DETERMINING THE RELATIONSHIP OF MOISTURE CONTENT AND QUALITY AND VALUE OF FARM CROPS

    E. CALCULATING STORAGE AND DISCOUNT LOSSES DUE TO EXCESSIVE MOISTURE CONTENT

2. DETERMINING MOISTURE CONTENT OF FARM CROPS

   A. IDENTIFYING FARM CROP TO BE DRIED

   B. IDENTIFYING CHARACTERISTICS OF MATURE CROP WHICH ASSIST IN DETERMINING MOISTURE CONTENT

   C. IDENTIFYING METHODS OF DETERMINING MOISTURE CONTENT OF THE CROP

   D. PERFORMING THE PROCEDURES OR PROCESSES FOR DETERMINING MOISTURE CONTENT EITHER BY VISUAL INSPECTION OR USE OF MOISTURE METERS

   E. CALCULATING OR ESTIMATING MOISTURE CONTENT BASED UPON UPON GATHERED DATA

3. SELECTING DRYING EQUIPMENT FOR FARM CROPS

   A. IDENTIFYING CROP TO BE DRIED

      (1) GRAIN
      (2) HAY AND FORAGE
      (3) SPECIALTY CROPS

   B. DETERMINING VOLUME OR AMOUNT OF CROP TO BE DRIED

   C. DETERMINING ENVIRONMENTAL CONDITIONS IN THE LOCAL AREA WHICH MAY AFFECT TYPE OF EQUIPMENT AND FACILITIES USED

      (1) MOISTURE
      (2) HUMIDITY
      (3) TEMPERATURE

   D. IDENTIFYING MOISTURE CONTENT OF CROP WHEN DRYING PROCESS IS TO BEGIN AND ITS RELATIONSHIP TO NEEDED DRYING FACILITIES AND EQUIPMENT

   E. IDENTIFYING TYPE AND KIND OF EQUIPMENT AND FACILITIES AVAILABLE FOR THE DRYING PROCESS

   F. DETERMINING ECONOMICS OF USING VARIOUS DRYING SYSTEMS

   G. DETERMINING EASE OF OPERATION, ADJUSTMENT AND MAINTENANCE OF AVAILABLE SYSTEMS

   H. DETERMINING CAPACITY OF AVAILABLE FACILITIES AND TIME NEEDED TO REACH DESIRED MOISTURE CONTENT OF CROP

4. OPERATION, CARE AND MAINTENANCE OF DRYING SYSTEMS

   A. READING THE OPERATOR'S MANUAL FOR CORRECT PROCEDURES OF OPERATION FOR VARIOUS TYPES OF EQUIPMENT USED

   B. IDENTIFYING DESIRED MOISTURE CONTENT OF CROP TO BE DRIED

   C. ADJUSTING DRYING EQUIPMENT FOR ACHIEVING MOISTURE CONTENT DESIRED

   D. MAKING PERIODIC CHECKS OF MOISTURE CONTENT AND SUBSEQUENT ADJUSTMENT OF EQUIPMENT

   E. PERFORMING SIMPLE MAINTENANCE AND LUBRICATION OF DRYING EQUIPMENT

      (1) ADJUSTING BELTS AND PULLEYS ON FANS
      (2) LUBRICATING ELECTRIC MOTORS AS NEEDED
      (3) SIMPLE MAINTENANCE PROCEDURES FOR AUGER SYSTEMS

   F. PERFORMING LONG TERM MAINTENANCE OF EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. IF MOISTURE METERS ARE AVAILABLE, HAVE STUDENTS PRACTICE DETERMINING THE MOISTURE CONTENT OF VARIOUS CROPS.

   B. USING EARS OF CORN AT VARIOUS STAGES OF MATURITY, LET STUDENTS USE VISUAL CHARACTERISTICS OF THE COB AND GRAIN TO ESTIMATE PERCENT MOISTURE. SOME OF THESE CHARACTERISTICS INCLUDE THE AMOUNT OF DENT, THE SIZE AND SWELLING OF GERMS, AND POSITION OF MATURITY LINE.

2. FOR SPECIFIC CROPS, HAVE STUDENTS COMPARE THE ADVANTAGES AND DISADVANTAGES OF VARIOUS TYPES OF CROP DRYING FACILITIES AND EQUIPMENT IN RELATION TO DRYING TIME, COST OF OPERATION, AND CAPITAL INVESTMENT NEEDED.

3. USING OPERATORS' MANUALS FOR EQUIPMENT THAT WOULD BE USED IN A "SIMULATED" DRYING SYSTEM, HAVE STUDENTS OUTLINE A PROCEDURE FOR OPERATING THE EQUIPMENT FOR A SPECIFIC FARM CROP NEEDING TO BE DRIED.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. HAVE STUDENTS LIST THE CHARACTERISTICS WHICH CAN BE USED TO ESTIMATE THE MOISTURE CONTENT OF A PARTICULAR

FARM CROP COMMON TO THE LOCAL AREA. THIS PROCESS SHOULD BE COMPLETED AT A LEVEL OF ACCURACY SATISFACTORY TO THE INSTRUCTOR.

B. THE STUDENTS SHOULD DEMONSTRATE OR DESCRIBE THE PROCEDURE TO DETERMINE MOISTURE CONTENT WITH A MOISTURE METER. EVALUATION SHOULD BE BASED UPON THE PROCEDURES OUTLINED IN THE MANUAL ACCOMPANYING THE PARTICULAR METER USED.

2. HAVE STUDENTS LIST THE FACTORS TO CONSIDER WHEN SELECTING EQUIPMENT AND FACILITIES TO USE FOR A DRYING SYSTEM. FOR COMPLETE ACCURACY, THIS LIST SHOULD INCLUDE: (1) TYPE OF CROP TO BE DRIED, (2) COST OF OPERATION AND CARE OF AVAILABLE EQUIPMENT, (3) CAPACITY OF EQUIPMENT NEEDED AND, (4) ENVIRONMENTAL CONDITIONS IN LOCAL AREA OR REGION WHICH MAY AFFECT EQUIPMENT SELECTED.

3. HAVE STUDENTS LIST THE SAFETY PRECAUTIONS TO FOLLOW WHEN OPERATING SPECIFIC TYPES OF DRYING EQUIPMENT. THESE PRECAUTIONS ARE CITED IN THE OPERATORS' MANUALS ACCOMPANYING THE VARIOUS TYPES OF EQUIPMENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MOISTURE METERS
2. OPERATORS' MANUALS FOR VARIOUS DRYING EQUIPMENT
3. CHARTS, GRAPHS AND OTHER DRAWINGS OF DRYING BINS, EQUIPMENT AND OTHER DRYING FACILITIES
4. SPECIMENS OF CROPS GROWN IN THE LOCAL AREA

F. EXAMPLES OF SUPPORTING REFERENCES

1. DRYING CORN ON THE FARM. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 139 PAGES.

   THIS PUBLICATION DEALS WITH DRYING CORN IN A COMPREHENSIVE MANNER AND PRESENTS PRINCIPLES OF DRYING WHICH MAY BE APPLIED TO OTHER FARM CROPS IN MANY CASES. EXTENSIVE DISCUSSION OF THE ACTUAL DRYING OPERATION FOR CORN IS ALSO INCLUDED.

2. PUBLICATIONS ARE AVAILABLE FROM COMPANIES SELLING VARIOUS TYPES OF DRYING EQUIPMENT WHICH OUTLINE THE PROCEDURES

INVOLVED IN DRYING SPECIFIC FARM CROPS. AN EFFORT SHOULD BE MADE TO ACQUIRE COPIES OF THIS INFORMATION.

3. THE STATE COOPERATIVE EXTENSION SERVICE IN MANY STATES HAVE BULLETINS DEALING WITH DRYING SPECIFIC CROPS AND THESE ARE READILY AVAILABLE FOR EDUCATIONAL PURPOSES.

HANDLING AND STORAGE OF FARM CROPS

UNIT CONCEPT: MEETING THE REQUIREMENTS FOR HANDLING FARM CROPS AS WELL AS PROVIDING ADEQUATE STORAGE FACILITIES WILL RESULT IN THE REDUCTION OF LABOR AND WILL INCREASE THE EFFICIENCY OF THE PRODUCTION OPERATION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE TYPE OF CROP(S), THE EXPECTED VOLUME OR AMOUNT OF CROP TO BE STORED, AND SUFFICIENT REFERENCES, DETERMINE THE TYPE AND SIZE OF FACILITIES NEEDED TO PROVIDE STORAGE FOR FARM CROPS SUCH THAT THE CROPS WILL BE MAINTAINED AT AN OPTIMUM LEVEL OF QUALITY.
2. WHEN GIVEN THE TYPE AND SIZE OF CROP STORAGE FACILITIES AND SUFFICIENT REFERENCES, PLAN THE TYPE OF MATERIALS HANDLING EQUIPMENT NECESSARY FOR THE EFFICIENT FLOW AND DISTRIBUTION OF CROP PRODUCTS.
3. WHEN GIVEN A VARIETY OF MATERIALS HANDLING EQUIPMENT, OPERATE THE EQUIPMENT ACCORDING TO THE OPERATOR'S MANUAL.
4. WHEN GIVEN A VARIETY OF MATERIALS HANDLING EQUIPMENT AND/OR STORAGE FACILITIES, PERFORM THE REQUIRED MAINTENANCE PROCEDURES OR PROCESSES AS SPECIFIED BY THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. PLANNING THE CROP STORAGE FACILITIES

   A. DETERMINING THE TYPE OF HARVESTED FARM CROPS TO STORE

      (1) GRAIN
      (2) FORAGE (ENSILAGE)
      (3) HAY
      (4) SPECIALTY CROP

   B. DETERMINING THE USE TO BE MADE OF THE HARVESTED CROP

   C. ANALYZING THE EXISTING FACILITIES SUCH AS GRAIN BINS, BARNS AND OTHER STORAGE FACILITIES

D. EVALUATING THE LONG-RANGE OBJECTIVES AND NEEDS OF THE CROPPING OPERATION

E. DETERMINING THE SPACE REQUIREMENTS FOR STORAGE FACILITIES

F. ESTIMATING COST OF CONSTRUCTION OF NEEDED NEW FACILITIES AND IMPROVEMENTS OF EXISTING FACILITIES

G. DETERMINING ANNUAL OWNERSHIP AND OPERATING COSTS

2. PLANNING AND SELECTING MATERIALS HANDLING SYSTEMS AND EQUIPMENT TO INCREASE EFFICIENCY AND REDUCE LABOR

A. SELECTING EQUIPMENT FOR CONVEYING CROPS INTO STORAGE FACILITIES

B. SELECTING EQUIPMENT FOR DISTRIBUTING STORED CROPS TO TO FEEDING FACILITIES OR TRANSPORTATION AREAS

C. ANALYZING EXISTING MATERIALS HANDLING FACILITIES

D. ESTIMATING CAPITAL INVESTMENT NEEDED TO PURCHASE OR IMPROVE EXISTING MATERIAL HANDLING EQUIPMENT

3. OPERATING AND MAINTAINING THE MATERIALS HANDLING EQUIPMENT AND STORAGE FACILITIES

A. USING THE OPERATORS' MANUALS FOR PROPER MATERIALS HANDLING OPERATION AND MAINTENANCE

B. OBSERVING SAFETY PRECAUTIONS

C. LUBRICATING THE EQUIPMENT

D. CHECKING FOR WORN OR LOOSE PARTS

E. PREPARING THE EQUIPMENT FOR STORAGE

F. PERFORMING THE NECESSARY MAINTENANCE TO STORAGE FACILITIES

C. EXAMPLES OF STUDENT LEARNING FACILITIES

1. A. HAVE STUDENTS EVALUATE A FARMSTEAD PLAN ON THE BASIS OF HOW THE MATERIALS HANDLING AND CROP STORAGE FACILITIES AND EQUIPMENT COULD BE IMPROVED.

B. VISIT AN AREA CROP FARMER AND OBSERVE HIS METHODS OF OF MATERIALS HANDLING AND STORAGE ARRANGEMENT. ASK IF

HE HAS ANY SUGGESTION OR PLANS FOR IMPROVEMENT WHICH HE WOULD SHARE WITH THE CLASS.

2. GIVE STUDENTS DESCRIPTIONS OF VARIOUS STORAGE FACILITIES AND HAVE THEM USE REFERENCES AND OTHER MATERIALS TO DETERMINE THE TYPE OF MATERIALS HANDLING EQUIPMENT NEEDED TO MEET THE NEEDS OF THE STORAGE FACILITIES AND TOTAL FARM SITUATION.

3. VISIT A FARM WITH A FEED HANDLING SYSTEM THAT IS HIGHLY MECHANIZED AND ASK THE FARMER TO DEMONSTRATE THE OPERATIONAL PROCEDURES TO THE CLASS.

4. A. STUDENTS SHOULD BRING IN A TYPE OF MATERIALS HANDLING EQUIPMENT TO ADJUST AND LUBRICATE USING THE OPERATOR'S MANUAL.

   B. HAVE STUDENTS OUTLINE A ROUTINE MAINTENANCE PROCEDURE OR PROGRAM FOR VARIOUS TYPES OF MATERIALS HANDLING EQUIPMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE THE STUDENTS DEVELOP A PLAN FOR STORAGE AND HANDLING OF A SPECIFIC FARM CROP AND THEN EXPLAIN IN WRITING THE REASONS WHY THEIR PLAN WILL INCREASE EFFICIENCY AND REDUCE LABOR COSTS. THIS PROCESS SHOULD BE EVALUATED BY THE TEACHER BASED UPON MATERIAL STUDIED IN CLASS AND CREATIVE THINKING BY THE STUDENT.

2. HAVE STUDENTS LIST THE FACTORS TO CONSIDER IN PLANNING AND SELECTING A MATERIALS HANDLING SYSTEM. THIS LISTING SHOULD INCLUDE: (1) TYPES OF CROP TO BE HANDLED, (2) COSTS OF PURCHASE AND UPKEEP, (3) LONG-RANGE NEEDS AND (4) ANALYZING EXISTING FACILITIES AND EQUIPMENT.

3. STUDENTS SHOULD DEMONSTRATE THE PROPER AND SAFE OPERATING PROCEDURES FOR SPECIFIC TYPES OF MATERIALS HANDLING EQUIPMENT. THE EVALUATION SHOULD BE BASED UPON THE RECOMMENDED PROCEDURES FOUND IN THE OPERATOR'S MANUAL.

4. USE PICTURES OR SCHEMATICS OF VARIOUS TYPES OF MATERIALS HANDLING EQUIPMENT, HAVE STUDENT LOCATE THE LUBRICATION POINTS. EVALUATIONS SHOULD BE BASED ON THE OPERATOR'S MANUAL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR'S MANUALS FOR APPROPRIATE TYPES OF MATERIALS HANDLING EQUIPMENT

2. DRAWINGS OR OTHER VISUAL AIDS OF VARIOUS TYPES AND SIZES OF STORAGE FACILITIES AND MATERIALS HANDLING EQUIPMENT

3. TABLES RELATING TO THE STORAGE AREA NECESSARY FOR VARIOUS FARM CROPS

4. FARMSTEAD PLANS WHICH SPECIFICALLY OUTLINE CROP STORAGE AND MATERIALS HANDLING EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. MC KENSIE, B. A. PLANNING GRAIN-FEED HANDLING FOR LIVESTOCK AND CASH-GRAIN FARMS. AMES, IOWA: MIDWEST PLAN SERVICE, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY. 1968.

   THIS REFERENCE CONTAINS DETAILED SKETCHES AND PLANS FOR GRAIN-FEED HANDLING LAYOUTS.

2. PLANNING GRAIN-FEED HANDLING. AMES, IOWA: MIDWEST PLAN SERVICE, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY. 1968.

   SKETCHES AND DRAWINGS INCLUDED SHOULD BE USEFUL FOR STUDYING VARIOUS TYPES OF FEED AND CROP HANDLING SYSTEMS.

3. MATERIALS FROM COMMERCIAL COMPANIES DEALING IN GRAIN BINS, ELEVATORS, SILOS AND MATERIALS HANDLING EQUIPMENT CAN USUALLY BE OBTAINED FREE OF CHARGE AND THESE MAKE GOOD SOURCES OF TECHNICAL CONTENT FOR THIS UNIT.

MARKET PRICE TRENDS AND CYCLES IN CROP MARKETING, SUPPLY AND DEMAND

UNIT CONCEPT: THE CONCEPT OF THE INTERACTION OF SUPPLY AND DEMAND HAS A GREAT DEAL TO DO WITH THE PRICE RECEIVED AT THE MARKET FOR FARM CROPS. LIKEWISE, PRICE TRENDS AND CYCLES ARE RELATED TO SUPPLY AND DEMAND. THE CROP PRODUCER MUST BE FAMILIAR WITH THESE CONCEPTS AND PRINCIPLES IN ORDER TO PLAN HIS MARKETING PROGRAM IN AN EFFORT TO REALIZE THE GREATEST RETURN.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. GIVEN SUPPLY AND DEMAND SCHEDULES AND THE BUSHELS, POUNDS OR OTHER APPROPRIATE MEASURES OF FARM CROPS TO BE SOLD, DETERMINE THE PRICE AND TOTAL RETURN EXPECTED BY CONSTRUCTING AND INTERPRETING SUPPLY/DEMAND CURVES.
2. THROUGH MARKET REPORTS FOR A FIVE-YEAR PERIOD FOR A GIVEN FARM CROP, DETERMINE THE CYCLIC PATTERN FOR PRICES AND THE MOST FEASIBLE TIME FOR MARKETING THE GIVEN CROP, CONSIDERING THE CYCLIC PATTERN AND THE SUPPLY AND DEMAND FOR THE PARTICULAR CROP.

B. INSTRUCTIONAL AREAS

1. DETERMINING EFFECT OF DEMAND ON MARKETS
    - A. DEFINING DEMAND, DEMAND CURVE AND DEMAND SCHEDULE
    - B. DEVELOPING A DEMAND CURVE FOR A FARM CROP
    - C. CHANGING THE DEMAND CURVE THROUGH A CHANGE IN PERSONAL PREFERENCE
    - D. DETERMINING THE RELATIONSHIP OF SEASON OF YEAR OR ENVIRONMENT ON MARKET DEMAND
    - E. DETERMINING THE EFFECT OF ELASTICITY AND INELASTICITY ON DEMAND
2. DETERMINING THE EFFECT OF SUPPLY ON MARKETS
    - A. DEFINING SUPPLY, SUPPLY SCHEDULES AND SUPPLY CURVES

B. DEVELOPING A SUPPLY CURVE FOR VARIOUS FARM CROPS

C. CHANGING THE SUPPLY SCHEDULE THROUGH TECHNOLOGY

D. CHANGING THE SUPPLY CURVE THROUGH TECHNOLOGY

E. DETERMINING THE RELATIONSHIP BETWEEN SUPPLY AND PRICE

F. DETERMINING THE EFFECT OF ELASTICITY AND INELASTICITY ON DEMAND

3. DETERMINING PRICE THROUGH INTERACTION OF SUPPLY AND DEMAND

A. COMBINING DEMAND AND SUPPLY SCHEDULES

B. DETERMINING PRICE USING DEMAND AND SUPPLY CURVES

(1) DETERMINING SHORTAGES AND SURPLUSES WITH DEMAND AND SUPPLY CURVES
(2) DETERMINING BUYER REACTION DURING SUPPLY SHORTAGES AND SURPLUSES
(3) DETERMINING RELATION OF EQUILIBRIUM PRICE AND SUPPLY-DEMAND CURVE

C. PRICE DETERMINATION AS INFLUENCED BY SEASONAL PRODUCTION-COMPLEX

D. PRICE DETERMINATION AS INFLUENCED BY A FREE MARKET-COMPLEX

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS CONSTRUCT DEMAND CURVES FOR A GIVEN FARM CROP(S). PROVIDE THEM WITH DEMAND SCHEDULES WHICH INCLUDE PRICE PER UNIT AND QUANTITY PURCHASED.

B. GIVE STUDENTS INFORMATION ABOUT PRICE PER UNIT AND AMOUNT OF FARM CROPS (UNITS) PURCHASED BEFORE AND AFTER A SIMULATED TECHNOLOGICAL ADVANCE; HAVE THEM CONSTRUCT A SUPPLY CURVE AND CALCULATE THE DIFFERENCES IN SUPPLY BETWEEN THE TWO SCHEDULES.

2. USING MARKET REPORTS ON VARIOUS FARM CROPS FOR FIVE DIFFERENT YEARS, HAVE STUDENTS PLOT THE FIVE CYCLES ON A GRAPH BY MONTHS AND THEN INTERPRET POSSIBLE REASONS FOR THE DIFFERENCES BETWEEN THE TWO. THIS MAY BE A GOOD METHOD TO DETERMINE THE POSSIBLE EFFECTS OF THE RUSSIAN WHEAT DEALS AND PHASE IV ON FARM-CROP PRICES AND TRENDS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. GIVE STUDENTS INFORMATION ABOUT A PARTICULAR FARM CROP FOR TWO DIFFERENT MONTHS INCLUDING PRICE PER UNIT AND NUMBER OF UNITS PURCHASED. (THIS INFORMATION MAY BE ACQUIRED FROM STATE MARKETING SERVICE AND NEWSPAPERS.) HAVE STUDENTS DETERMINE THE PERCENT INCREASE IN DEMAND BETWEEN THE TWO PARTICULAR MONTHS.

2. THE STUDENTS SHOULD BE ABLE TO CONSTRUCT A GRAPH ILLUSTRATING PRICE TRENDS AND CYCLES FOR SPECIFIC FARM CROPS AND ESTIMATE WITHIN ONE MONTH WHEN THE CROPS SHOULD BE MARKETED TO REALIZE THE GREATEST RETURN.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. GRAPH PAPER

2. MARKET REPORTS FROM NEWSPAPERS, COOPERATIVE EXTENSION SERVICES, U.S. DEPARTMENT OF AGRICULTURE OR STATE MARKETING SERVICES, FOR SEVERAL YEARS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL MARKETING PRINCIPLES. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, PP. 21-84.

   THIS PUBLICATION IS WRITTEN FOR THE TEACHER AND PROVIDES ACTIVITIES AND EXPERIENCES DESIGNED TO DEVELOP A WORKING UNDERSTANDING OF THE CONCEPTS OF SUPPLY/DEMAND PRICE DETERMINATION.

2. U.S. DEPARTMENT OF AGRICULTURE AND STATE COOPERATIVE EXTENSION SERVICES

   SEVERAL PUBLICATIONS ARE AVAILABLE FROM THESE AGENCIES DEALING WITH THIS UNIT'S CONCEPTS AS THEY RELATE TO REGIONS OR STATES.

SELECTING FARM CROP MARKETING OUTLETS

UNIT CONCEPT: THE MARKETING SYSTEM IS A VERY COMPLEX PROCESS IN THE COUNTRY TODAY. AVAILABLE METHODS OF MARKETING VARY ACCORDING TO THE TYPE OF CROPS TO BE MARKETED; THEREFORE, THE PRODUCER MUST BE FAMILIAR WITH THE MARKETS AVAILABLE TO HIM AS WELL AS TO BE ABLE TO SELECT THE MOST FEASIBLE AND PROFITABLE METHOD IN ORDER TO REALIZE THE GREATEST RETURN FOR HIS INVESTMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A LIST OF AVAILABLE MARKETS FOR A SPECIFIC TYPE OF CROP (GRAINS, FRUITS AND VEGETABLES) AND THE NUMBER OF UNITS OF THE CROP TO BE MARKETED, DETERMINE THE MOST APPROPRIATE METHOD TO USE CONSIDERING SERVICES OFFERED, SELLING COSTS, COMPETITION AND RETURN.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING AVAILABLE MARKETS
   - A. DETERMINING TYPE OF FARM CROP TO BE MARKETED
   - B. IDENTIFYING AVAILABLE MARKETS FOR SPECIFIC CROPS
     - (1) COUNTY ELEVATOR OUTLETS
     - (2) LOCAL MARKETS
     - (3) COOPERATIVE MARKETS
2. DETERMINING CHARACTERISTICS OF AND SELECTING MARKET OUTLETS
   - A. DETERMINING MARKETING COSTS REQUIRED FOR VARIOUS OUTLETS
   - B. DETERMINING TRANSPORTATION NEEDS FOR AVAILABLE MARKETS
   - C. DETERMINING PRICE VARIATIONS ACCORDING TO GRADE DIFFERENCES
   - D. DEFINING PROCEDURES REQUIRED FOR MARKETING THROUGH VARIOUS OUTLETS

E. DETERMINING EFFECT OF FUTURES TRADING AND HEDGING ON VARIOUS MARKETING METHODS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. FROM NEWSPAPER MARKET REPORTS, HAVE THE STUDENTS COMPARE THE MARKET PRICES AT VARIOUS TYPES OF MARKETS AND THEN EXPLAIN DIFFERENCES IN TERMS OF DISTANCE, COST AND COMPETITION.

   B. HAVE STUDENTS IDENTIFY AVAILABLE MARKETS IN THE LOCAL AREA AND THEN, WITH A GIVEN FARM CROP, HAVE STUDENTS FIGURE RETURN AND COSTS IN TERMS OF CHARGES AND COMMISSIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS MATCH THE MOST APPROPRIATE AVAILABLE MARKETING METHODS WITH GIVEN SITUATIONS WHICH SPECIFY NUMBER OF ANIMALS TO BE MARKETED, MARKETING COSTS OR CHARGES, COMPETITION EXPECTED, AND ESTIMATED RETURN.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MARKET REPORTS (NEWSPAPERS, U.S. DEPARTMENT OF AGRICULTURE, STATE COOPERATIVE EXTENSION SERVICES)

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL MARKETING PRINCIPLES. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, PP. 1-20.

   THIS PUBLICATION DEALS WITH VARIOUS MARKETING CHANNELS AND, MORE SPECIFICALLY, WITH COST COMPARISONS FOR THE VARIOUS CHANNELS.

2. MORTENSON, WILLIAM P. MODERN MARKETING OF FARM PRODUCTS. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1963, PP. 87-146.

   THIS BOOK CONTAINS A COMPREHENSIVE DISCUSSION OF ALL TYPES OF MARKETS AND IS WRITTEN SO AS TO BE EASILY UNDERSTOOD BY HIGH SCHOOL STUDENTS.

GRADING FARM CROPS

UNIT CONCEPT: THE GRADES OF FARM CROPS PLAY A LARGE PART IN THE RPICES PAID FOR PARTICULAR FARM CROPS. THE FARM PRODUCER SHOULD HAVE A WORKING KNOWLEDGE OF THE VARIOUS CROP GRADES IN ORDER TO ESTIMATE RETURNS FOR HIS PRODUCTS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIC FARM CROP AND THE CRITERIA FOR GRADING THE CROP, DETERMINE THE MARKET GRADE ACCORDING TO U.S.D.A GRADING STANDARDS.

B. INSTRUCTIONAL AREAS

1. GENERAL CONSIDERATIONS IN GRADING FARM CROPS
   A. DETERMINING IMPORTANCE OF GRADES AND MARKET VALUE
   B. IDENTIFYING CROPS GROWN LOCALLY WHICH ARE MARKETED ON THE BASIS OF GRADES
   C. DETERMINING WHEN AND WHERE GRADING OF VARIOUS CROPS IS ACCOMPLISHED
2. GRADING GRAIN
   A. IDENTIFYING TYPE OF GRAIN CROP TO BE GRADED
   B. DETERMINING TYPE OF GRADING SCALE(S) USED FOR GRAINS
   C. IDENTIFYING RANGE OF GRADES FOR SPECIFIC GRAIN CROPS
   D. IDENTIFYING AND DEFINING CRITERIA FOR GRAIN GRADING
      (1) TEST WEIGHT PER BUSHEL
      (2) SOUNDNESS
      (3) DRYNESS
      (4) CLEANLINESS
      (5) PURITY OF TYPE
      (6) GENERAL CONDITION
   E. PROCEDURES FOR DETERMINING GRADE OF GRAIN

3. GRADING FRUIT AND VEGETABLE CROPS

   A. IDENTIFYING FRUITS AND/OR VEGETABLES TO BE GRADED

   B. DETERMINING GRADING SCALES AND GRADES FOR SPECIFIC FRUITS AND VEGETABLES

   C. USING VARIOUS CRITERIA FOR DETERMINING GRADES OF SPECIFIC CROPS

      (1) APPEARANCE
      (2) TEXTURE
      (3) COLOR
      (4) SIZE
      (5) SHAPE

4. GRADING HAY AND FORAGE CROPS

   A. DETERMINING WHEN GRADING OF FORAGE CROPS IS NECESSARY

   B. IDENTIFYING GROUPS OF HAY FOR WHICH GRADING STANDARDS HAVE BEEN ESTABLISHED

   C. IDENTIFYING GRADES OF HAY

   D. IDENTIFYING AND DEFINING FACTORS AFFECTING GRADE

      (1) LEAFINESS (LEGUMES)
      (2) COLOR
      (3) FOREIGN MATTER
      (4) MATURITY
      (5) FINENESS

   E. IDENTIFYING MINIMUM AND MAXIMUM REQUIREMENTS FOR GRADES OF SPECIFIC FORAGE CROPS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS PRACTICE GRADING VARIOUS FARM CROPS ESPECIALLY THOSE COMMON TO THE LOCAL AREA. IT WOULD BE BEST IF STUDENTS SUPPLY SAMPLES OF VARIOUS CROPS FROM THEIR OWN ENTERPRISES FOR THIS EXERCISE.

   B. HAVE STUDENTS MAKE A DISPLAY ILLUSTRATING THE VARIOUS GRADES OF SPECIFIC CROPS (HAY, VEGETABLES, GRAINS). THEY COULD DISPLAY THIS IN THE SCHOOL OR CONDUCT A PROGRAM WHICH SHOWS THE RELATIONSHIP OF GRADES TO QUALITY AND PRICES PAID BY THE CONSUMER.

C. FROM MARKET REPORTS IN THE NEWSPAPER OR OTHER SOURCE, HAVE STUDENTS COMPARE THE PRICES PAID FOR VARIOUS GRADES OF FARM CROPS AND THEN HAVE THEM DETERMINE HOW THESE DIFFERENCES CAN AFFECT THE RETURN ON INVESTMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. SET UP A GRADING EXERCISE FOR FARM CROPS COMMONLY GROWN IN THE LOCAL AREA AND HAVE STUDENTS DETERMINE THE GRADE(S) OF THE VARIOUS CROPS. STUDENTS SHOULD BE ABLE TO CORRECTLY GRADE THE CROPS WITH 90% ACCURACY.

B. STUDENTS SHOULD BE ABLE TO LIST THE FACTORS DETERMINING GRADES OF SPECIFIC CROPS. FOR GRAINS, THIS LISTING SHOULD INCLUDE: TEST WEIGHT, SOUNDNESS, DRYNESS, CLEANLINESS, PURITY OF TYPE AND GENERAL CONDITION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. GRADING STANDARDS FOR SPECIFIC FARM CROPS (U.S.D.A.)

2. GRAIN SAMPLES FOR GRADING

3. VARIOUS SAMPLES OF HAY, FORAGES, FRUITS AND VEGETABLES FOR PRACTICE GRADING

F. EXAMPLES OF SUPPORTING REFERENCES

1. MARTIN, JOHN H. AND LEONARD, WARREN H. PRINCIPLES OF FIELD CROP PRODUCTION. NEW YORK, NEW YORK: THE MAC MILLAN COMPANY. 1967, PP. 220-241.

A COMPREHENSIVE TEXTBOOK WHICH PRESENTS A GOOD OVERVIEW DEALING WITH GRADING GRAINS AND FORAGE CROPS.

2. PUBLICATIONS SHOULD BE ACQUIRED FROM THE U.S.D.A. MARKETING SERVICE WHICH OUTLINE THE OFFICIAL GRADING STANDARDS FOR SPECIFIC FARM CROPS. SOME PUBLICATIONS FROM YOUR STATE COOPERATIVE EXTENSION SERVICE MAY BE OF VALUE WHEN DEALING WITH THE STUDY AREAS IN THIS UNIT.

RANGE PLANT ECOLOGY

UNIT CONCEPT: SUCCESSFUL MANAGEMENT OF RANGE LAND REQUIRES A KNOWLEDGE OF THE ENVIRONMENT IN WHICH A PLANT LIVES. ECOLOGICAL FACTORS AFFECTING PLANT GROWTH WILL HAVE A BEARING ON THE MANAGEMENT DECISIONS MADE REGARDING RANGE LANDS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. EXPLAIN THE CHARACTERISTICS OF THE FIVE BASIC CLIMATIC FACTORS AND HOW THEY AFFECT PLANT GROWTH WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.
2. EXPLAIN THE CHARACTERISTICS OF THE FOUR BASIC SOIL FACTORS AND HOW THEY AFFECT PLANT GROWTH WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.
3. IDENTIFY FIVE PLANT COMMUNITIES COMMON TO THEIR AREA.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING CLIMATIC FACTORS AFFECTING PLANT GROWTH AND DEVELOPMENT
    - A. RAINFALL
    - B. TEMPERATURE
    - C. ALTITUDE
    - D. WIND
    - E. LIGHT
2. DETERMINING SOIL FACTORS THAT AFFECT PLANT GROWTH AND DEVELOPMENT
    - A. EFFECTS OF SOIL TEXTURE
    - B. EFFECTS OF SOIL PH
    - C. EFFECTS OF SOIL DEPTH

D. EFFECTS OF SOIL STRUCTURE

3. RECOGNIZING PLANT COMMUNITIES

A. VISUAL DETERMINATION

B. PROCESS OF CHANGE

(1) PLANT SUCCESSION
(2) RETROGRESSION
(3) SECONDARY SUCCESSION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS OBSERVE AND TAKE NOTE OF THE CHARACTERISTICS OF PLANT COMMUNITIES AFFECTED BY THE CLIMATIC FACTORS DISCUSSED IN THE CONTENT.

2. A. HAVE STUDENTS TEST THE TOP SOIL DEPTH IN AREAS OF EXCELLENT AND POOR PLANT GROWTH AND, AT THE SAME TIME, OBSERVE SOIL STRUCTURE.

B. HAVE STUDENTS OBSERVE SAMPLES OF SOIL TEXTURES AND IDENTIFY SOIL TEXTURES USING SOIL SIEVES.

C. HAVE STUDENTS TEST SOIL PH IN VARIOUS PLANT COMMUNITIES TO GAIN KNOWLEDGE OF THE TYPES OF PLANTS GROWING IN SOILS OF VARIOUS PH LEVELS.

3. HAVE STUDENTS LOCATE PLANT COMMUNITIES AND IDENTIFY THE TYPE OF COMMUNITIES PRESENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT IDENTIFY THE FIVE CLIMATIC FACTORS AFFECTING PLANT GROWTH AND DISCUSS HOW EACH FACTOR AFFECTS THE GROWTH.

2. HAVE EACH STUDENT TEST SOIL PH WITHIN ± .5 PH AND INDICATE HOW PH AFFECTS PLANT GROWTH.

3. GIVEN A PARTICULAR RANGE SITE, HAVE EACH STUDENT IDENTIFY THE PLANT COMMUNITIES PRESENT.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SOIL PH TESTING KIT

2. SHOVEL OR SPADE

3. SOIL ANALYSIS SIEVES

F. EXAMPLES OF SUPPORTING REFERENCES

1. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE AND STUDENT MANUAL. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 444 PAGES.

   THIS MATERIAL INCLUDES SPECIFIC AREAS COVERING THE CLIMATIC AND SOIL FACTORS WHICH AFFECT RANGE MANAGEMENT.

RANGE PLANT IDENTIFICATION

UNIT CONCEPT: AN IMPORTANT ASPECT OF RANGE MANAGEMENT IS THE ABILITY TO DETERMINE RANGE CONDITION. IN ORDER TO DETERMINE THE CONDITION OF A GIVEN RANGE, THE INDIVIDUAL MUST FIRST RECOGNIZE THE PLANT SPECIES GROWING ON THAT RANGE. THE ABILITY TO RECOGNIZE RANGE PLANTS IS AN ESSENTIAL TO MANY FACETS OF RANGE MANAGEMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN SHOWN EXAMPLES OF EACH, IDENTIFY WITH 100% ACCURACY THE FOUR TYPES OF RANGE PLANTS.

2. WHEN SHOWN A LIVE SAMPLE OF A GRASS PLANT, NAME AND POINT OUT ALL OF THE PARTS OF A GRASS PLANT WITH 100% ACCURACY.

3. USING A PLANT IDENTIFICATION KEY WHEN NECESSARY, IDENTIFY AND NAME THE GRASSLIKE PLANTS AND THE RANGE GRASS PLANTS OF THE WHEATGRASS, GRAMA, OATGRASS, FESCUE, REDTOP AND BLUESTEM TRIBES COMMON TO THE COMMUNITY WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.

4. USING A PLANT IDENTIFICATION KEY, IDENTIFY AND NAME FIVE RANGE FORBS COMMON TO THE COMMUNITY.

5. USING A PLANT IDENTIFICATION KEY, IDENTIFY AND NAME TEN RANGE SHRUBS COMMON TO THE COMMUNITY.

6. IDENTIFY AND NAME THE POISONOUS RANGE PLANTS COMMON TO THE COMMUNITY.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE TYPES OF RANGE PLANTS

   A. CHARACTERISTICS OF GRASSES

   B. CHARACTERISTICS OF GRASSLIKE PLANTS

   C. CHARACTERISTICS OF FORBS

   D. CHARACTERISTICS OF SHRUBS

2. RECOGNIZING PARTS OF THE GRASS PLANT
   - A. RECOGNIZING TYPES OF SEED HEADS
   - B. IDENTIFYING THE PARTS OF THE SEED HEAD
   - C. IDENTIFYING VEGETATIVE PARTS OF GRASS PLANTS
3. IDENTIFYING RANGE GRASSES OF THE SIX GRASS TRIBES
   - A. WHEATGRASS TRIBE
   - B. GRAMA TRIBE
   - C. OATGRASS TRIBE
   - D. FESCUE TRIBE
   - E. REDTOP TRIBE
   - F. BLUESTEM TRIBE
4. IDENTIFYING COMMON RANGE FORBS
5. IDENTIFYING COMMON RANGE SHRUBS
6. IDENTIFYING COMMON POISONOUS PLANTS
7. USING PLANT IDENTIFICATION KEYS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS COLLECT AND IDENTIFY SPECIMENS OF GRASSES, FORBS, SHRUBS AND POISONOUS PLANTS COMMON IN THEIR AREA.
2. HAVE THE STUDENTS TAKE APART A GRASS SPECIMEN AND LABEL THE PARTS OF THE GRASS PLANT ON A DIAGRAM.
3. HAVE THE STUDENTS COLLECT AND IDENTIFY SPECIMENS OF RANGE GRASS PLANTS OF EACH TRIBE FOUND IN THE REGION.
4. TAKE A FIELD TRIP TO SOME RANGE LAND AND HAVE THE STUDENTS OBSERVE AND STUDY PLANT MOUNTS AND/OR SLIDES OF RANGE FORBS TO AID THEM IN BECOMING COMPETENT IN THEIR IDENTIFICATION PROCESS.
5. HAVE THE STUDENTS USE A PLANT IDENTIFICATION KEY AND IDENTIFY THE RANGE SHRUBS IN A SPECIFIED RANGE AREA.

6. HAVE THE STUDENTS COLLECT AND DEVELOP A DISPLAY OF THE COMMON POISONOUS RANGE PLANTS FOUND IN THEIR AREA.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DISTINGUISH BETWEEN GRASSES, GRASS-LIKE PLANTS, FORBS AND SHRUBS USING LIVE SPECIMENS, SLIDES OR MOUNTS.
2. HAVE EACH STUDENT IDENTIFY ALL PARTS OF A RANGE GRASS PLANT.
3. HAVE EACH STUDENT IDENTIFY COMMON RANGE GRASSES WITH 90% ACCURACY USING AN IDENTIFICATION KEY.
4. HAVE EACH STUDENT IDENTIFY COMMON RANGE FORBS WITH 90% ACCURACY USING AN IDENTIFICATION KEY.
5. HAVE EACH STUDENT IDENTIFY COMMON RANGE SHRUBS WITH 90% ACCURACY USING AN IDENTIFICATION KEY.
6. HAVE EACH STUDENT IDENTIFY COMMON POISONOUS RANGE PLANTS WITH 100% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PLANT IDENTIFICATION KEY (COMMON TO THE AREA)
2. RANGE PLANT MOUNTS
3. SLIDES OF COMMON RANGE PLANTS
4. PROJECTOR

F. EXAMPLES OF SUPPORTING REFERENCES

1. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

   THE UNIT OUTLINE CONTAINS PLANT IDENTIFICATION KEYS AS WELL AS COMPLETE GUIDES TO RECOGNITION OF COMMON POSIONOUS PLANTS.

2. TIPS ON "GRASS" IDENTIFICATION USING VEGETATIVE CHARACTERISTICS. CIRCULAR 1089. BOZEMAN, MONTANA: COOPERATIVE EXTENSION SERVICE, MONTANA STATE UNIVERSITY. 1968.

THIS PAMPHLET CONTAINS PROCEDURES FOR IDENTIFYING "GRASSES" USING THE CHARACTERISTICS OF THE VEGETATIVE PARTS.

RANGE CONDITION, TREND AND UTILIZATION

UNIT CONCEPT: SUCCESSFUL RANGE MANAGEMENT REQUIRES KNOWLEDGE OF THE PROCEDURES IN DETERMINING RANGE CONDITION, TREND AND UTILIZATION. AS AN INDIVIDUAL DETERMINES THESE FACTORS, HE IS ABLE TO USE THE INFORMATION IN MAKING MANAGEMENT DECISIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. PLACE RANGE PLANTS INTO THE PROPER GROUPING FOR RANGE CONDITON ANALYSIS WITH AN ACCURACY OF 90%.
2. USING THE SOIL CONSERVATION SERVICE RANGE CONDITION ANALYSIS METHOD, DETERMINE RANGE CONDITION ON A GIVEN SITE TO WITHIN ± 10% OF THE ACTUAL RANGE CONDITION SCORE.
3. UPON COMPLETION OF A RANGE CONDITION ANALYSIS, CLASSIFY RANGE LAND INTO THE PROPER CONDITION CLASSIFICATION WITH COMPLETE ACCURACY.
4. FIGURE THE STOCKING RATE FOR A GIVEN RANGE SITE WITH A GIVEN CONDITION TO WITHIN ± TWO ANIMAL UNITS FOR EACH 100 ACRES ON THE SITE.
5. DETERMINE RANGE TREND ON A GIVEN SITE TO WITHIN ± 10% OF THE DESIRABLE PLANTS AVAILABLE.
6. ANALYZE THE PROPER RANGE UTILIZATION ON A GIVEN SITE TO WITHIN ± 10% OF THE ACTUAL AMOUNT OF FORAGE GRAZED.

B. INSTRUCTIONAL AREAS

1. GROUPING PLANTS FOR RANGE CONDITION ANALYSIS
   A. DECREASER PLANTS
   B. INCREASER PLANTS
   C. INVADER PLANTS
2. DETERMINING RANGE CONDITION USING THE SOIL CONSERVATION SERVICE RANGE CONDITION ANALYSIS METHOD

3. CLASSIFYING RANGE CONDITIONS BASED ON PERCENTAGE OF FORAGE PRODUCED ON CLIMAX VEGETATION

   A. EXCELLENT: 75 TO 100 PERCENT

   B. GOOD: 50 TO 75 PERCENT

   C. FAIR: 25 TO 50 PERCENT

   D. POOR: 0 TO 15 PERCENT

4. FIGURING STOCKING RATES

5. DETERMINING RANGE TREND

   A. VISUAL EXAMINATION

   B. PACE TRANSECT METHOD

   C. PARKER THREE-STEP METHOD

6. ANALYZING PROPER RANGE UTILIZATION

   A. KEY SPECIES CONCEPT

   B. EYEBALL METHOD

   C. PHOTOGRAPHY METHOD

   D. OCCULAR PLOT ESTIMATE

   E. ENCLOSURES METHODS

   F. COMPARISON METHODS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. GIVE THE STUDENTS A LIST OF 25 PLANTS AND HAVE THEM GROUP THEM INTO THE PROPER GROUPING FOR RANGE CONDITION ANALYSIS.

2. A. HAVE THE STUDENTS DETERMINE RANGE CONDITION IN THE CLASSROOM USING HYPOTHETICAL PLANT DATA AND THE SOIL CONSERVATION SERVICE TECHNICIAN GUIDES.

   B. HAVE THE STUDENTS DETERMINE THE RANGE CONDITION ON THREE DIFFERENT RANGE SITES USING THE APPROPRIATE SOIL CONSERVATION SERVICE TECHNICIAN GUIDES.

3. GIVE THE STUDENTS 10 RANGE CONDITION PERCENTAGES AND HAVE THE STUDENTS CLASSIFY THE PERCENTAGES INTO THE PROPER CONDITION CLASSIFICATION.

4. A. HAVE THE STUDENTS FIGURE STOCKING RATES IN THE CLASSROOM USING HYPOTHETICAL RANGE DATA.

   B. HAVE THE STUDENTS FIGURE STOCKING RATES FOR THE RANGE SITES IN WHICH THEY HAVE DETERMINED CONDITION.

5. HAVE THE STUDENTS DEVELOP A RANGE STOCKING PLAN FOR RANGELAND THAT IS IN AN UPWARD AND/OR DOWNWARD TREND.

6. HAVE THE STUDENTS DETERMINE THE RANGE UTILIZATION ON THREE VARIOUS RANGE SITES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT GROUP RANGE PLANTS INTO THE PROPER GROUPING FOR RANGE CONDITION ANALYSIS.

2. HAVE THE STUDENTS DETERMINE RANGE CONDITIONS ON A GIVEN SITE USING THE SOIL CONSERVATION RANGE CONDITION ANALYSIS METHOD.

3. HAVE EACH STUDENT CLASSIFY 10 DIFFERENT RANGE CONDITION PERCENTAGES INTO THE PROPER CONDITION CLASSIFICATION.

4. HAVE EACH STUDENT FIGURE THE PROPER STOCKING RATE FOR A GIVEN RANGE CONDITON.

5. HAVE EACH STUDENT DETERMINE RANGE TREND ON A SITE SPECIFIED BY THE INSTRUCTOR TO WITHIN ± 10% OF THE DESIRABLE PLANTS AVAILABLE.

6. HAVE EACH STUDENT ANALYZE THE PROPER RANGE UTILIZATION ON A GIVEN SITE TO WITHIN ± 10% OF THE ACUTAL AMOUNT OF FORAGE GRAZED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE TECHNICIAN GUIDES APPLICABLE TO THE AREA

F. EXAMPLES OF SUPPORTING REFERENCES

1. TECHNICIANS' GUIDE. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE, U.S. GOVERNMENT PRINTING OFFICE.

THIS GUIDE CONTAINS INFORMATION CONCERNING THE SOIL CONSERVATION SERVICE RANGE CONDITION ANALYSIS METHOD.

2. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

   UNIT SIX OF THIS PUBLICATION COVERS RANGE CONDITIONS, TREND AND UTILIZATION.

RANGE GRAZING MANAGEMENT

UNIT CONCEPT: SUCCESSFUL RANGE MANAGEMENT REQUIRES A KNOWLEDGE OF GRAZING SYSTEMS AND THE PROPER MANAGEMENT OF GRAZING LANDS. A GRAZING PLAN IS NECESSARY TO MAINTAIN QUALITY RANGELANDS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE PROPER GRAZING SEASON ACCORDING TO THE STAGE OF PLANT GROWTH WITH ACCURACY OF ± TWO WEEKS.
2. SELECT THE PROPER MEANS OF DISTRIBUTING GRAZING TO OBTAIN MAXIMUM USE OF ALL AVAILABLE RANGE LAND.
3. ADJUST GRAZING OPERATIONS ON A GIVEN RANGE SITE ACCORDING TO THE AMOUNT OF FORAGE PRODUCTION TO WITHIN ± TWO ANIMAL UNITS FOR EACH 100 ACRES ON THE SITE.
4. DETECT RANGE MISUSE AND ADJUST GRAZING TO WITHIN ± TWO ANIMAL UNITS FOR EACH 100 ACRES ON THE SITE.
5. SELECT A GRAZING SYSTEM AND DEVELOP A GRAZING PLAN FOR THE SYSTEM THAT WOULD BE FEASIBLE ACCORDING TO SPECIFICATIONS DESIGNATED BY THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE PROPER GRAZING SEASON
    - A. RANGE READINESS
    - B. SOIL READINESS
2. DISTRIBUTING GRAZING
    - A. SALTING
    - B. FENCING
    - C. HERDING
    - D. TRAIL BUILDING

- E. DEVELOPING WATERING AREAS
- F. SELECTING PROPER CLASS OF LIVESTOCK

3. ADJUSTING GRAZING OPERATIONS TO FORAGE PRODUCTION
    - A. DECREASING THE HERD
    - B. INCREASING THE HERD
4. DETECTING RANGE MISUSE
    - A. BEST FORAGE PLANTS DECREASING
    - B. SOIL DISTURBANCE OR EROSION
    - C. CONDITION OF THE LIVESTOCK
5. SELECTING GRAZING SYSTEMS
    - A. CONTINUOUS GRAZING
    - B. DEFERRED GRAZING
    - C. ROTATION GRAZING
    - D. DEFERRED-ROTATION GRAZING
    - E. REST-ROTATION GRAZING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS MAKE A LIST OF COMMON RANGE PLANTS AND INDICATE THE MINIMUM STAGE OF PLANT GROWTH NECESSARY BEFORE GRAZING MAY BEGIN ON SUCH GRASSES.
2. HAVE SOIL CONSERVATION SERVICE PERSONNEL AS RESOURCE PERSONS TO DISCUSS GRAZING SYSTEMS.
3. A. HAVE STUDENTS DEVELOP A STOCKING PLAN FOR RANGE LAND THAT HAS AN INCREASING AMOUNT OF FORAGE ON IT.

    B. HAVE STUDENTS DEVELOP A STOCKING PLAN FOR RANGE LAND THAT HAS A DECREASING AMOUNT OF AVAILABLE FORAGE.
4. HAVE STUDENTS OBSERVE HEAVILY GRAZED RANGE AND DEVELOP A PLAN FOR DISTRIBUTING GRAZING ON THE RANGE.

5. HAVE STUDENTS DEVELOP A GRAZING PLAN FOR EACH OF THE GRAZING SYSTEMS DISCUSSED IN THE CONTENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. ON A SPECIFIED SITE, HAVE EACH STUDENT IDENTIFY WHEN THE RANGE CAN BE SAFELY GRAZED ACCORDING TO THE STAGE OF PLANT GROWTH.
2. HAVE EACH STUDENT SELECT THE PROPER MEANS OF DISTRIBUTING GRAZING ON A SPECIFIED SITE.
3. HAVE EACH STUDENT DETERMINE THE NECESSARY ADJUSTMENT OF GRAZING OPERATIONS ACCORDING TO THE AMOUNT OF AVAILABLE FORAGE ON A SPECIFIED SITE.
4. HAVE EACH STUDENT LIST THE FACTORS WHICH SHOULD BE CONSIDERED IN DETERMINING RANGE MISUSE.
5. HAVE EACH STUDENT SELECT THE GRAZING SYSTEM MOST SUITABLE TO A GIVEN SITUATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TECHNICIAN GUIDES. SOIL CONSERVATION SERVICE, U.S. DEPARTMENT OF AGRICULTURE

F. EXAMPLES OF SUPPORTING REFERENCES

1. HOUSTON, W.R. EFFECTS OF STOCKING RATES ON RANGE VEGETATION AND BEEF CATTLE PRODUCTION ON THE NORTHERN GREAT PLAINS. TECHNICAL BULLETIN NO. 1357. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1966.

   THIS BULLETIN COVERS STOCKING RATES AND THEIR RESULTANT EFFECTS ON RANGE VEGETATION.

2. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANA: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

   UNIT SEVEN OF THIS PUBLICATION COVERS GRAZING SYSTEMS AND PRACTICES.

RANGE RENOVATION PRACTICES

UNIT CONCEPT: IF RANGE LAND HAS BEEN IMPROPERLY MANAGED OVER A LONG PERIOD TO TIME, THE CONDITION OF THE RANGE CAN BECOME SO POOR THAT RENOVATION BECOMES NECESSARY. IT IS ESSENTIAL TO BE ABLE TO SELECT AND USE THE PROPER REMOVATION PRACTICE TO RESTORE SUCH RANGE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A PARTICULAR SITUATION, DETERMINE THE FEASIBILITY OF RANGE RENOVATION TO THE DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.
2. IDENTIFY THE FOUR STEPS OF THE RANGE RENOVATION PROCESS WITH COMPLETE ACCURACY.
3. SELECT THE PROPER RENOVATION PRACTICE FOR A GIVEN SITUATION WITH A DEGREE OF ACCURACY SPECIFIED BY THE INSTRUCTOR.
4. DETERMINE THE COST OF RENOVATION PRACTICES WITHIN ± $2.00 PER ACRE.
5. IDENTIFY STATE AND FEDERAL AGENCIES FROM WHICH HELP CAN BE OBTAINED TO MAKE MANAGEMENT DECISIONS AND/OR FINANCIAL ASSISTANCE CAN BE SECURED.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE FEASIBILITY OF RANGE RENOVATION
    - A. RANGE CONDITION
    - B. TYPE OF SOIL
    - C. SLOPE OF THE LAND
    - D. SIZE OF AREA TO BE CONSIDERED FOR TREATMENT
    - E. COST OF THE TREATMENT
    - F. AVAILABILITY OF EQUIPMENT

G. USE OF AREA BY WILDLIFE

H. OTHER USES

2. IDENTIFYING THE STEPS IN THE RANGE RENOVATION PROCESS

A. FINDING THE CAUSE OF RANGE RETROGRESSION

B. DECIDING WHICH RENOVATION PRACTICE IS BEST SUITED FOR THE SITUATION

C. COMPLETING THE RENOVATION PROCESS

D. MAINTAINING PROPER RANGE MANAGEMENT PRACTICES

3. SELECTING RENOVATION PRACTICES

A. SPRAYING

B. PITTING AND INTERSEEDING

C. DEFERRED GRAZING

D. CROSSFENCING

E. FERTILIZING

F. BURNING

4. DETERMINING COST OF RENOVATION

A. MAKING A BUDGET

B. ANALYZING COSTS

5. IDENTIFYING STATE AND FEDERAL AGENCIES FOR ASSISTANCE

A. AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE

B. SOIL CONSERVATION SERVICE

C. FOREST SERVICE

D. BUREAU OF LAND MANAGEMENT

E. BUREAU OF INDIAN AFFAIRS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS DETERMINE THE FEASIBILITY OF RENOVATING A GIVEN RANGE SITE.

2. HAVE A RESOURCE PERSON FROM THE SOIL CONSERVATION SERVICE OR OTHER GOVERNMENTAL AGENCY DISCUSS WITH THE STUDENTS THE RANGE RENOVATION PROCESS.
3. HAVE STUDENTS DEVELOP A PLAN FOR RENOVATING A GIVEN RANGE SITE.
4. HAVE STUDENTS FIGURE THE COST OF USING EACH RANGE RENOVATION PRACTICE ON A RANGE TRACT OF 320 ACRES.
5. HAVE AS RESOURCE PERSONS REPRESENTATIVES FROM VARIOUS GOVERNMENTAL AGENCIES TO EXPLAIN THEIR ROLE IN RANGE MANAGEMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DETERMINE THE FEASIBILITY OF RENOVATING A GIVEN RANGE LAND AREA.
2. HAVE EACH STUDENT IDENTIFY AND DESCRIBE THE FOUR STEPS OF THE RANGE RENOVATION PROCESS.
3. HAVE EACH STUDENT SELECT THE PROPER RANGE RENOVATION PRACTICE FOR A GIVEN SITE AS DETERMINED BY A REPRESENTATIVE OF THE SOIL CONSERVATION SERVICE.
4. HAVE EACH STUDENT DETERMINE THE COST PER ACRE OF EACH RANGE RENOVATION PRACTICE TO BE USED ON A SPECIFIED RANGE SITE.
5. HAVE EACH STUDENT IDENTIFY AND EXPLAIN THE SERVICES PROVIDED BY THE STATE AND FEDERAL AGENCIES IN THE AREA THAT ASSIST IN MANAGING RANGELANDS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. RANGE RESOURCE MANAGEMENT - UNIT OUTLINE. PUBLICATION NO. 4. BOZEMAN, MONTANT: DEPARTMENT OF AGRICULTURAL EDUCATION, MONTANA STATE UNIVERSITY. 1968, 276 PAGES.

   UNIT EIGHT IN THIS PUBLICATION COVERS THOSE AREAS OF RANGE RENOVATION CONSIDERED IN THIS UNIT.

IV

AGRICULTURAL MECHANICS
U.S.O.E. CODE 01.01 03 00 00

PLANNING AND ESTABLISHING A FARM SHOP OR SERVICE CENTER

SELECTION OF COMMON HAND AND POWER TOOLS

REPAIR AND MAINTENANCE OF HAND AND POWER TOOLS

SHOP AND TOOL SAFETY PROCEDURES

ELECTRIC WELDING IN AGRICULTURAL MECHANICS

OXY-ACETYLENE WELDING AND CUTTING

METAL WORK

PLUMBING

FINISHING AND PRESERVING MATERIALS, EQUIPMENT OR BUILDINGS

PLANNING FARMSTEAD BUILDINGS

USING CONSTRUCTION PLANS AND BLUEPRINTS

SELECTION OF LUMBER, HARDWARE AND OTHER BUILDING MATERIALS

PREPARING BUILDING SITES AND FOUNDATIONS

BUILDING CONSTRUCTION TECHNIQUES AND PROCESSES

USING CONCRETE ON THE FARM

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FENCE CONSTRUCTION AND MAINTENANCE

OPERATION AND CARE OF SMALL GASOLINE ENGINES

MAINTENANCE OF SMALL GASOLINE ENGINES

SELECTING POWER EQUIPMENT BASED ON NEEDS

AGRICULTURAL MECHANICS (CONTINUED)

SIMPLE MAINTENANCE AND REPAIR OF FARM POWER EQUIPMENT

PREPARING FARM POWER EQUIPMENT FOR STORAGE

SELECTION, OPERATION AND MAINTENANCE OF TILLAGE MACHINERY

SELECTION, OPERATION AND MAINTENANCE OF FERTILIZER, WEED, INSECT AND DISEASE CONTROL MACHINERY

SELECTION, OPERATION AND MAINTENANCE OF PLANTING EQUIPMENT

SELECTION, OPERATION AND MAINTENANCE OF HARVESTING EQUIPMENT

SELECTION, OPERATION AND MAINTENANCE OF PROCESSING AND HANDLING EQUIPMENT

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DRAINAGE SYSTEM MAINTENANCE

PLANNING FARM IRRIGATION SYSTEMS

PLANNING AND ESTABLISHING FARM RESERVOIRS

OPERATION AND MAINTENANCE OF IRRIGATION SYSTEMS

ELECTRICAL POWER - ITS NATURE AND MEASUREMENT

SELECTION AND USE OF CONDUCTORS

WIRING PROCEDURES FOR SIMPLE CIRCUITS

PLANNING AND INSTALLING THE MAIN SERVICE ENTRANCE

ELECTRIC MOTORS - SELECTION AND MAINTENANCE

PLANNING AND ESTABLISHING A FARM SHOP OR SERVICE CENTER

UNIT CONCEPT: MANY SUCCESSFUL FARM OPERATIONS MAKE USE OF A FARM SHOP OR SERVICE CENTER IN ORDER TO HAVE AN ADVANTAGE IN THE CONVENIENCE AND LOWERED COSTS FOR MAINTAINING AND REPAIRING FARM EQUIPMENT AND FACILITIES. TO BE MOST EFFICIENT AND EFFECTIVE, THE PLANNING OF THE SERVICE CENTER MUST CONSIDER SIZE, LOCATION, CONVENIENCE, HEATING, VENTILATION, STORAGE AND ELECTRICAL REQUIREMENTS AS WELL AS THE SELECTION AND PLACEMENT OF EQUIPMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A CHOICE OF LOCATION ON THE FARMSTEAD FOR A FARM SHOP OR SERVICE CENTER, SELECT A LOCATION ACCESSIBLE TO UTILITIES AND MOST CONVENIENT AND SUITABLE FOR CONSTRUCTION AND MAINTENANCE OF FARM EQUIPMENT.

2. WHEN GIVEN THE FARM EQUIPMENT POSSIBLY IN NEED OF CONSTRUCTING AND MAINTENANCE, DETERMINE THE DIMENSIONS OF A SERVICE CENTER INCLUDING FLOOR SPACE, HEIGHT AND THE OVERHEAD DOOR SIZE SUCH THAT ALL THE JOBS OF CONSTRUCTION AND MAINTENANCE CAN BE ADEQUATELY PERFORMED.

3. WHEN GIVEN THE POWER TOOLS TO BE PLACED IN THE FARM SERVICE CENTER AND THE ELECTRIC LIGHTING NEEDS OF THE CENTER, CALCULATE THE ELECTRICAL REQUIREMENTS BASED UPON RECOMMENDATIONS OF NATIONAL, STATE AND LOCAL ELECTRICAL CODES.

4. FOR A GIVEN NUMBER OF CUBIC FEET OF THE SERVICE CENTER TO BE HEATED, THE STUDENT WILL DETERMINE THE SIZE AND TYPE OF HEATER TO BE USED TO PROVIDE ADEQUATE HEAT IN THE SERVICE CENTER DURING COLD WEATHER.

5. WHEN GIVEN THE DIMENSIONS FOR FLOOR SPACE, THE LOCATION OF WINDOWS AND HEATING EQUIPMENT AND THE LOCATION OF THE OVERHEAD DOOR, DETERMINE THE INTERIOR ARRANGEMENT OF THE FARM SERVICE CENTER INCLUDING THE WORK AREA, LOCATION OF POWER TOOLS, HAND TOOL STORAGE AREAS, OTHER STORAGE AREAS, AND WORK BENCHES TO THE EXTENT THAT ALL JOBS OF CONSTRUCTION AND MAINTENANCE CAN BE PERFORMED IN A SAFE, EFFICIENT AND CONVENIENT MANNER.

6. USING THE PLANNED SIZE, LOCATION, INTERIOR ARRANGEMENT, COST AND AVAILABILITY OF MATERIALS, SELECT THE TYPE

OF CONSTRUCTION AND DETERMINE THE KIND OF MATERIALS THAT WILL PROVIDE THE MOST SERVICEABLE BUILDING AT THE LEAST COST ACCORDING TO BUILDING CODES AND RECOMMENDATIONS OF BUILDING SPECIALISTS.

B. INSTRUCTIONAL AREAS

1. EVALUATING FARMSTEAD LOCATIONS FOR ESTABLISHING A FARM SHOP OR SERVICE CENTER

    A. DETERMINING ACCESSIBILITY OF ELECTRIC POWER AND WATER SUPPLY

    B. CALCULATING COSTS OF CONSTRUCTION AT DIFFERENT LOCATIONS

        (1) DEPTH OF CONCRETE FOOTINGS
        (2) AMOUNT OF FILL MATERIAL NEEDED
        (3) ATTACHMENT TO AN EXISTING BUILDING

    C. EVALUATING LOCATIONS FOR ADEQUATE SERVICE YARD

2. DETERMINING SIZE OF FARM SHOP OR SERVICE CENTER

    A. CALCULATING SPACE REQUIRED FOR CONSTRUCTION, SERVICING AND REPAIR OF EQUIPMENT

    B. DETERMINING OVERHEAD DOOR SIZE REQUIRED FOR EQUIPMENT TO BE CONSTRUCTED, SERVICED OR REPAIRED

3. DETERMINING THE ELECTRICAL NEEDS OF THE FARM SHOP OR SERVICE CENTER

    A. CALCULATING LIGHTING NEEDS AND WATTAGE REQUIREMENTS

    B. DETERMINING VOLTAGE NEEDS (120 OR 240) FOR EQUIPMENT TO BE USED IN CONSTRUCTION, SERVICE AND REPAIR

        (1) ARC WELDER
        (2) POWER TOOLS WITH ELECTRIC MOTORS

    C. LOCATING ELECTRICAL SERVICE OUTLETS AND DETERMINING WATTAGE REQUIREMENTS

    D. CALCULATING AMPERAGE SIZE OF SERVICE ENTRANCE BOX

4. DETERMINING THE HEATING REQUIREMENTS AND FUEL TO BE USED

    A. CALCULATING THE HEATING REQUIREMENTS

    B. EVALUATING THE AVAILABLE FUEL SOURCES

C. DETERMINING THE TYPE OF HEATING UNIT TO USE

D. DETERMINING THE LOCATION OF HEATING UNIT IN SERVICE CENTER

5. SELECTING EQUIPMENT NEEDED IN CONSTRUCTION SERVICE AND REPAIR

A. DETERMINING KINDS OF EQUIPMENT NEEDED

B. DETERMINING SIZE OF EQUIPMENT

6. PLANNING THE ARRANGEMENT OF THE FARM SHOP OR SERVICE CENTER

A. DETERMINING THE LOCATION OF THE OVERHEAD DOOR

B. DETERMINING THE LOCATION OF THE STORAGE AREA

C. DETERMINING THE LOCATION OF WORK BENCHES AND TOOL CABINETS

D. DETERMINING THE LOCATION OF THE SERVICE AND REPAIR EQUIPMENT

(1) WELDERS
(2) AIR COMPRESSOR
(3) POWER SAW

7. PLANNING WINDOW REQUIREMENTS

A. CALCULATING NUMBER AND KIND NEEDED

B. DETERMINING WHERE WINDOWS WILL BE PLACED

8. PLANNING THE TYPE OF CONSTRUCTION TO USE

A. DETERMINING SUITABLE FRAMING DETAILS AND ROOF TYPES

B. CALCULATING COST OF MATERIALS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. TAKE FIELD TRIPS TO FARMS FOR THE PURPOSE OF EXAMINING SUITABLE FARM SHOPS OR SERVICE CENTERS. THEN HAVE STUDENTS LIST REQUIREMENTS FOR A FARM SHOP OR SERVICE CENTER. IF A FIELD TRIP IS IMPOSSIBLE TO DO, USE SLIDES, PICTURES OR OTHER VISUAL AIDS.

2. A. HAVE STUDENTS PREPARE A LIST OF THE EQUIPMENT ON THEIR HOME FARMS PROBABLY IN NEED OF CONSTRUCTION AND MAINTENANCE.

   B. HAVE STUDENTS PREPARE A DIAGRAM OF THE INTERIOR ARRANGEMENT OF THE FARM SHOP OR SERVICE CENTER.

3. A. HAVE STUDENTS DIAGRAM THE ELECTRIC WIRING ARRANGEMENT OF THE FARM SHOP OR SERVICE CENTER, INCLUDING SERVICE ENTRANCE BOX, LIGHTS, SWITCHES, SERVICE OUTLETS AND LABELING 120 AND 240 OUTLETS.

   B. HAVE STUDENTS CALCULATE THE TOTAL WATTAGE REQUIREMENTS AND THE AMPERAGE LOAD OF THE SERVICE ENTRANCE BOX.

   C. HAVE STUDENTS PREPARE A LIST OF THE ELECTRICAL CODE REQUIREMENTS FOR THE PLANNED ELECTRICAL WIRING OF THE SERVICE CENTER.

4. A. HAVE STUDENTS CALCULATE THE HEAT REQUIREMENTS FOR THE SERVICE CENTER AND MAKE A COMPARISON COST CHART OF THE DIFFERENT FUELS AVAILABLE.

   B. HAVE STUDENTS MAKE COST COMPARISONS OF HEATING EQUIPMENT.

5. HAVE STUDENTS DIAGRAM THE INTERIOR ARRANGEMENT OF THE SERVICE CENTER, LOCATING THE WORK AREA, POWER TOOLS, HAND TOOL STORAGES AND OTHER STORAGE AREAS.

6. A. USING THE MATERIALS AVAILABLE FOR CONTRUCTION OF THE FARM SHOP OR SERVICE CENTER, HAVE STUDENTS MAKE COST COMPARISONS.

   B. USING DIFFERENT ROOF-TYPE PLANS, HAVE STUDENTS MAKE COMPARISONS ON COSTS AND EASE OF CONSTRUCTION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING VISUAL AIDS, FIELD TRIP, SLIDES OR PICTURES OF A FARMSTEAD, HAVE STUDENTS SELECT THE BEST SITE FOR LOCATION OF THE FARM SHOP OR SERVICE CENTER AND GIVE VALID REASONS FOR THEIR SELECTION.

2. PROVIDE STUDENTS WITH A LIST OF FARM EQUIPMENT IN NEED OF CONSTRUCTION AND MAINTENANCE AND A DIAGRAM OF THE INTERIOR OF A FARM SHOP OR SERVICE CENTER AND HAVE THEM LIST THE DIMENSIONS OF THE FLOOR, CEILING HEIGHT AND OVERHEAD DOOR NECESSARY TO CARRY OUT THE ACTIVITIES.

3. A. PROVIDE STUDENTS WITH A WIRING DIAGRAM OF A FARM SHOP OR SERVICE CENTER, A LIST OF THE ELECTRIC NEEDS (POWER TOOLS, LIGHTS AND SO ON) AND HAVE THEM LABEL THE 120- AND 240-VOLT LINES AND CALCULATE THE WATTAGE REQUIREMENTS AND SIZE (AMPERAGE) OF THE SERVICE ENTRANCE BOX.

   B. FROM A LIST OF ELECTRICAL CODE SPECIFICATIONS, HAVE STUDENTS SELECT THOSE THAT WOULD APPLY TO THE FARM SHOP OR SERVICE CENTER ELECTRIC WIRING PLANS.

4. A. PROVIDE STUDENTS WITH THE HEATING REQUIREMENTS FOR A FARM SHOP OR SERVICE CENTER AND A LIST OF FUELS AND COSTS AND HAVE THEM SELECT THE FUEL TO USE BASED UPON AVAILABILITY AND LEAST COST.

   B. FROM A LIST OF SPECIFICATIONS FOR HEATING EQUIPMENT, HAVE STUDENTS SELECT THOSE THAT WOULD APPLY TO SELECTION OF HEATING EQUIPMENT FOR A FARM SHOP OR SERVICE CENTER.

5. HAVE STUDENTS DIAGRAM THE INTERIOR ARRANGEMENT OF A FARM SHOP OR SERVICE CENTER, LOCATING THE WORK AREA, POWER TOOLS AND STORAGE AREAS.

6. A. PROVIDE STUDENTS WITH TWO TYPES OF ROOF CONSTRUCTION PLANS AND HAVE THEM MAKE COST COMPARISONS OF MATERIALS AND LABOR.

   B. PROVIDE STUDENTS WITH A SPECIFIED BUILDING DIMENSION, TWO TYPES OF MATERIAL THAT COULD BE USED AND HAVE THEM CALCULATE THE COST OF EACH.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MEASURING AND SURVEYING EQUIPMENT
2. MECHANICAL CALCULATOR
3. ARCHITECT SCALE
4. GRAPH PAPER
5. BUILDING PLANS
6. SAMPLES OF BUILDING MATERIALS

F. EXAMPLES OF SUPPORTING REFERENCES

1. PHIPPS, LLOYD J. MECHANICS IN AGRICULTURE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1967, PP. 43-58.

THIS SECTION GIVES A GENERAL OVERVIEW OF FACTORS TO CONSIDER IN ESTABLISHING A FARM SHOP OR SERVICE CENTER.

2. PLANNING AND EQUIPPING A SERVICE CENTER FOR YOUR FARM. AMES, IOWA: COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY. 1972, PP. 16.

THIS REFERENCE GIVES DETAILED INFORMATION IN PLANNING AND ESTABLISHING A FARM SHOP OR SERVICE CENTER. NUMEROUS DIAGRAMS AND PICTURES ARE USED IN ILLUSTRATING THE INFORMATION PRESENTED.

SELECTION OF COMMON HAND AND POWER TOOLS

UNIT CONCEPT: THE SUCCESSFUL CONSTRUCTION AND MAINTENANCE OF FARM EQUIPMENT IS DEPENDENT, TO A CONSIDERABLE EXTENT, ON THE TOOLS AVAILABLE TO DO THE JOBS REQUIRED. SELECTION OF TOOLS SHOULD BE BASED ON NEEDS OF CONSTRUCTION, MAINTENANCE AND EQUIPMENT OF THE FARM IN ORDER THAT THE MECHANICAL PHASES OF THE FARM BUSINESS WILL FUNCTION ECONOMICALLY AND EFFICIENTLY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH THE CONSTRUCTION AND MAINTENANCE JOBS OF THE FARM WHICH ARE PLANNED TO BE DONE BY THE STUDENT, DETERMINE THE NUMBER, KIND AND SIZE OF HAND AND POWER TOOLS NEEDED, ACCORDING TO RECOMMENDATIONS OF FARM CONSTRUCTION, EQUIPMENT SERVICE PERSONNEL, AND AGRICULTURAL ENGINEERING SPECIALISTS.

2. WHEN PRESENTED WITH A LIST OF HAND AND POWER TOOLS NEEDED FOR THE CONSTRUCTION AND MAINTENANCE JOBS OF A FARM, DETERMINE WHERE THE TOOLS WILL BE OBTAINED BASED ON COST, QUALITY, AVAILABILITY AND SAFETY FEATURES.

B. INSTRUCTIONAL AREAS

1. SURVEYING AND INVENTORYING THE CONSTRUCTION AND MAINTENANCE NEEDS OF THE FARM

2. SELECTING HAND AND POWER TOOLS

   A. CONSTRUCTION JOBS AND THE TOOLS REQUIRED FOR EACH JOB

   B. MAINTENANCE JOBS AND THE TOOLS REQUIRED FOR EACH JOB

3. DETERMINING SUPPLY SOURCES OF HAND AND POWER TOOLS

   A. COMPARING COSTS, QUALITY, AND SAFETY FEATURES OF TOOLS

   B. COMPARING COSTS TO PURCHASE OR RENT CERTAIN TOOLS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. USE A FIELD TRIP TO A FARM SERVICE CENTER FOR THE PURPOSE OF PREPARING A LIST OF FARM EQUIPMENT CONSTRUCTION AND MAINTENANCE OPERATIONS AND THE TOOLS REQUIRED TO PERFORM THESE OPERATIONS.

   B. CONSULT WITH FARM EQUIPMENT AND FARM CONSTRUCTION PERSONNEL REGARDING TOOLS USED BY THEM.

   C. HAVE EACH STUDENT PREPARE A LIST OF HAND AND POWER TOOLS REQUIRED FOR THEIR HOME FARM SITUATION.

2. A. VISIT BUSINESS PLACES OFFERING TOOLS FOR SALE, OBTAINING PRICE LISTS AND OBSERVING QUALITY AND SAFETY FEATURES OF THE TOOLS.

   B. VIEW SLIDES, PICTURES OR OTHER VISUALS OF HAND AND POWER TOOLS.

   C. VISIT BUSINESS PLACES OFFERING TOOL RENTAL SERVICES, OBSERING THE QUALITY AND SAFETY FEATURES OF TOOLS AND OBTAINING RENTAL COSTS.

   D. HAVE STUDENTS USE TOOL CATALOGUES TO OBTAIN PRICES OF TOOLS.

   E. HAVE STUDENTS MAKE COMPARISON COSTS OF PURCHASE OR RENTAL OF PORTABLE POWER TOOLS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE EACH STUDENT WITH A SPECIFIC LIST OF FARM EQUIPMENT AND CONSTRUCTION ITEMS; AFTER EACH ITEM, HAVE THEM LIST THE TOOLS REQUIRED TO PERFORM THE SERVICE OR CONSTRUCTION WITH 90% ACCURACY.

2. A. SHOW SLIDES, PICTURES OR THE ACTUAL TOOLS; HAVE STUDENTS EVALUATE THEM ACCORDING TO QUALITY AND SAFETY FEATURES.

   B. PROVIDE STUDENTS WITH COSTS, QUALITY AND SAFETY FEATURES OF SPECIFIC TOOLS FROM TWO OR THREE SUPPLY SOURCES; HAVE THEM SELECT THE SUPPLY SOURCE WHICH WILL PROVIDE THE HIGHEST QUALITY TOOLS AT THE LEAST COST.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TOOL CATALOGUES

2. TOOL GUIDES

3. SLIDES, PHOTOGRAPHS OR OTHER VISUALS OR TOOLS

F. EXAMPLES OF SUPPORTING REFERENCES

1. BASIC HAND TOOLS. WASHINGTON, D.C.: NAVY TRAINING COURSE, NAVY PERSONNEL, U.S. GOVERNMENT PRINTING OFFICE.

   GIVES A GENERAL OVERVIEW AND DISCUSSION OF COMMON HAND TOOLS INCLUDING LABELED PARTS AND USES OF THESE TOOLS.

2. PLANNING AND EQUIPPING A SERVICE CENTER FOR YOUR FARM. AMES, IOWA: COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY.

   THIS REFERENCE PROVIDES SUGGESTED LISTS OF HAND AND POWER TOOLS NEEDED IN A FARM SERVICE CENTER. THE LIST INCLUDES SIZE AND NUMBER OF TOOLS NEEDED.

3. FUNDAMENTALS OF SERVICE: SHOP TOOLS. MOLINE, ILLINOIS: JOHN DEERE SERVICE PUBLICATION. 1971, 36 PAGES.

   CONTAINS A COMPREHENSIVE DISCUSSION OF COMMONLY USED HAND TOOLS INCLUDING USE, MAINTENANCE, SIMPLE REPAIR AND SAFETY RULES.

REPAIR AND MAINTENANCE OF HAND AND POWER TOOLS

UNIT CONCEPT: HAND AND POWER TOOLS WHICH ARE IN GOOD CONDITION PERFORM JOBS FASTER, EASIER, AND ARE SAFER TO OPERATE. PREVENTATIVE MAINTENANCE AND REPAIR TO TOOLS AS NEEDED INSURES THAT THEY WILL PERFORM THESE FUNCTIONS ADEQUATELY AND THAT WEAR AND DETERIORATION ARE KEPT TO A MINIMUM.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH HAND TOOLS AND COMPONENTS OF POWER TOOLS WITH CUTTING EDGES, DETERMINE WHICH TOOLS ARE PRACTICAL TO SHARPEN, WITH ACCURACY ACCORDING TO APPROVED SHARPENING RECOMMENDATIONS AND TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN PROVIDED WITH HAND OR POWER TOOLS IN NEED OR REPAIR, MAKE THE NEEDED REPAIRS SUCH THAT ALL SAFETY REQUIREMENTS ARE MET AND THE TOOLS ARE IN SATISFACTORY WORKING CONDITION, ACCORDING TO MANUFACTURER'S SPECIFICATIONS AND TO THE SATISFACTION OF THE INSTRUCTOR.

3. WHEN GIVEN THE HAND AND PORTABLE POWER TOOLS, ARRANGE AND STORE THE TOOLS SUCH THAT THEY ARE EASILY ACCESSIBLE AND WILL NOT BE DAMAGED OR LOST, MEETING THE RECOMMENDATION OF THE INSTRUCTOR AND TOOL MANUFACTURER.

B. INSTRUCTIONAL AREAS

1. MAINTAINING HAND TOOLS

   A. DETERMINING TOOLS THAT ARE PRACTICAL TO SHARPEN

   B. SELECTING TOOLS TO BE CUSTOM SHARPENED

      (1) HAND SAWS AND POWER SAW BLADES
      (2) SELECTION OF SAW SHARPENING SERVICE CENTER

   C. SHARPENING SELECTED TOOLS

   D. CLEANING TOOLS

   E. PREVENTING RUST

2. MAINTAINING POWER TOOLS
    - A. LUBRICATING BEARINGS
    - B. CLEANING MOTORS
    - C. PREVENTING RUST
    - D. ADJUSTING SAFETY GUARDS
    - E. SELECTING, DRESSING AND TRUING GRINDING WHEELS
3. REPAIRING HAND TOOLS
    - A. SELECTING AND REPLACING WOOD HANDLES
    - B. REMOVING "MUSHROOM" HEADS ON CHISELS AND PUNCHES
    - C. REMOVING RUST
4. REPAIRING POWER TOOLS
    - A. REPLACING MOTOR BRUSHES
    - B. REPLACING ELECTRICAL SWITCHES
    - C. REPLACING DAMAGED ELECTRICAL CORDS
    - D. REPLACING WORN BEARINGS
    - E. REPLACING DAMAGED OR MISSING BELT AND BLADE GUARDS
5. STORING TOOLS
    - A. SELECTING SUITABLE LOCATIONS
    - B. SELECTING STORAGE CABINETS, BINS OR WALL RACKS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. VISIT A SAW SHARPENING SHOP OBSERVING THE SKILL OF THE OPERATOR AND TOOLS REQUIRED TO PERFORM THE SHARPENING JOBS. THEN HAVE THE INSTRUCTOR DISCUSS WITH STUDENTS THE PRACTICALITY OF SAW SHARPENING. IN PLACE OF A FIELD TRIP, SHOW SLIDES OR OTHER VISUALS.

    B. DEVELOP WITH STUDENTS A LIST OF TOOLS THEY CAN SATISFACTORILY SHARPEN; INCLUDE WITH THE LIST INFORMATION REGARDING THE KIND OF SHARPENING EQUIPMENT REQUIREMENT AND ANGLE DEGREE SPECIFICATIONS.

C. HAVE STUDENTS MAKE SHARPENING TEMPLATES FOR HAND TOOLS WITH THE PROPER ANGLE DEGREE.

D. HAVE STUDENTS PRACTICE SHARPENING SEVERAL HAND TOOLS USING THE PROPER SHARPENING EQUIPMENT AND TECHNIQUES. CHECK THE PERFORMANCE OF THE TOOL AFTER SHARPENING.

2. A. OBTAIN HAND TOOLS THAT HAVE WOOD HANDLES IN POOR CONDITION; HAVE STUDENTS DETERMINE THE QUALITY OF REPLACEMENT HANDLE TO USE, PROCEDURES FOR REMOVING THE DAMAGED HANDLE, AND PROCEDURES FOR INSTALLING THE NEW HANDLE.

B. HAVE STUDENTS PRACTICE REPLACING HANDLES IN ONE OR TWO HAND TOOLS.

C. OBTAIN CHISELS AND PUNCHES WITH MUSHROOM HEADS; HAVE STUDENTS DETERMINE THE SAFETY HAZARDS FROM USING TOOLS IN THIS CONDITION AND DETERMINE HOW TO CORRECT THE CONDITION.

D. DEMONSTRATE PROCEDURES FOR REMOVING RUST FROM TOOLS.

3. A. OBTAIN HAND POWER TOOLS WITH DEFECTIVE ELECTRICAL CONDITIONS; HAVE STUDENTS DETERMINE HOW TO CORRECT THE CONDITION.

B. HAVE STUDENTS PRACTICE REPAIRING HAND POWER TOOLS WITH DEFECTIVE ELECTRICAL CONDITIONS.

C. HAVE STUDENTS SELECT AND APPLY MATERIALS TO PREVENT RUST OF HAND AND POWER TOOLS.

D. HAVE STUDENTS EXAMINE PLANS OF TOOL STORAGE ARRANGEMENTS AND SELECT AN ARRANGEMENT FOR STORING HAND AND PORTABLE POWER TOOLS FOR THEIR OWN FARM SHOP OR SERVICE CENTER.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PROVIDE STUDENTS WITH INFORMATION REGARDING ANGLE SPECIFICATIONS FOR MAKING A TOOL SHARPENING TEMPLATE AND HAVE THEM MAKE ONE FROM A PIECE OF SCRAP METAL.

B. PROVIDE STUDENTS WITH SEVERAL DIFFERENT TOOLS IN NEED OF SHARPENING; HAVE THEM DETERMINE THE ANGLE OR ANGLES TO SHARPEN AND SELECT THE PROPER SHARPENING EQUIPMENT OR TOOL TO USE.

2. A. PROVIDE STUDENTS WITH SEVERAL REPLACEMENT HANDLES; HAVE THEM SELECT THE ONE MOST SUITABLE TO USE.

   B. PROVIDE STUDENTS WITH TWO OR THREE HAND TOOLS REQUIRING WOOD HANDLE REPLACEMENTS. HAVE THEM REMOVE THE DEFECTIVE HANDLE AND INSTALL A NEW ONE.

   C. PROVIDE STUDENTS WITH A COLD CHISEL OR PUNCH WITH A MUSHROOM HEAD AND HAVE THEM REMOVE THE DEFECT.

   D. HAVE STUDENTS DEMONSTRATE HOW TO CLEAN AND REMOVE RUST FROM TWO OR THREE HAND TOOLS.

   E. PROVIDE STUDENTS WITH A PORTABLE HAND TOOL WITH DEFECTIVE ELECTRICAL EQUIPMENT; HAVE THEM DIAGNOSE THE DEFECTS AND MAKE THE NEEDED REPAIRS.

   F. HAVE STUDENTS DEMONSTRATE THE PROCEDURE TO PROPERLY CLEAN AND LUBRICATE AN ELECTRIC MOTOR OF A POWER TOOL.

3. A. PROVIDE STUDENTS WITH A LIST OF HAND AND POWER TOOLS; HAVE THEM PREPARE A DIAGRAM FOR STORING THE TOOLS.

   B. HAVE STUDENTS DEMONSTRATE HOW TO PREPARE TWO OR THREE HAND TOOLS FOR STORAGE TO PREVENT RUST.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SEVERAL HAND TOOLS IN NEED OF SHARPENING
2. SEVERAL PORTABLE POWER TOOLS WITH DEFECTS
3. SCRAP METAL FOR MAKING SHARPENING TEMPLATE
4. SEVERAL HAND TOOLS WITH DEFECTIVE WOOD HANDLES
5. SHARPENING EQUIPMENT - GRINDERS, FILES, SHARPENING STONES
6. RUST REMOVAL MATERIALS
7. RUST PREVENTIVE MATERIALS
8. SEVERAL MOTORS NEEDING CLEANING AND LUBRICATION

F. EXAMPLES OF SUPPORTING REFERENCES

1. JONES. SHOPWORK ON THE FARM. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1970, 626 PAGES.

THIS REFERENCE BOOK IS WRITTEN FOR STUDENT USE; IT GIVES DETAILS REGARDING SHARPENING TOOLS AND REPLACING WOOD HANDLES.

2. SHARPENING HAND TOOLS. VAS 3005. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 13 PAGES.

   THIS REFERENCE DESCRIBES PROCEDURES TO FOLLOW IN SHARPENING MOST OF THE COMMON HAND TOOLS; THE REFERENCE IS PROFUSELY ILLUSTRATED WITH DIAGRAMS DESCRIBING SHARPENING PROCEDURES.

SHOP AND TOOL SAFETY PROCEDURES

UNIT CONCEPT: THE USE OF SHOP TOOLS AND EQUIPMENT IS A POTENTIAL SOURCE OF MANY TYPES OF ACCIDENTS AND, TO PREVENT INJURY, THE OPERATOR NEEDS TO BE AWARE OF POSSIBLE HAZARDS AND HOW TO AVOID OR COPE WITH THEM. IN ADDITION TO CARE WHEN HANDLING TOOLS, CONSIDERATION SHOULD BE GIVEN TO SUITABLE CLOTHING, EYE AND EAR PROTECTION, SAFETY SHIELDS, ORDERLINESS, COLOR CODING AND LIGHTING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN WORKING IN SHOP SITUATIONS, DETERMINE AND USE PERSONAL SAFETY PRACTICES REGARDING SUITABLE CLOTHING, EYE AND EAR PROTECTION, AND WORK HABITS ACCORDING TO RECOMMENDATIONS OF THE STATE AND NATIONAL SAFETY COUNCILS AND TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN WORKING IN THE AGRICULTURAL MECHANICS SHOP, DETERMINE THE FIRE HAZARDS AND CORRECT THEM, IF NEEDED, ACCORDING TO PROCEDURES RECOMMENDED BY THE STATE AND NATIONAL SAFETY COUNCIL AND LOCAL FIRE DEPARTMENT.

3. WHEN WORKING IN SITUATIONS INVOLVING THE USE OF HAND TOOLS, DETERMINE AND USE ALL SAFETY PRECAUTIONS ACCORDING TO RECOMMENDATIONS OF SAFETY SPECIALISTS AND THE INSTRUCTOR.

4. WHEN WORKING IN SITUATIONS INVOLVING THE USE OF POWER TOOLS, EITHER PORTABLE OR FIXED POSITION, DETERMINE AND USE ALL SAFETY PRACTICES ACCORDING TO RECOMMENDATIONS OF THE STATE AND NATIONAL SAFETY COUNCIL AND THE EQUIPMENT MANUFACTURER.

5. WHEN WORKING IN SHOP SITUATIONS INVOLVING WELDING, BOTH GAS AND ELECTRIC, DETERMINE AND USE SAFE PRACTICES ACCORDING TO STATE AND NATIONAL SAFETY COUNCIL RECOMMENDATIONS AND TO THE SATISFACTION OF THE INSTRUCTOR.

6. WHEN GIVEN MAINTENANCE AND SERVICE JOBS INVOLVING TRACTORS AND OTHER MACHINERY, DETERMINE AND USE ALL SAFETY PRACTICES ACCORDING TO RECOMMENDATIONS OF SAFETY SPECIALISTS AND TO THE SATISFACTION OF THE INSTRUCTOR.

7. USING A GIVEN SHOP ARRANGEMENT AND THE SHOP EQUIPMENT TO BE INCLUDED, SELECT THE CORRECT COLOR FOR EACH AREA OR

PIECE OF EQUIPMENT AS PRESCRIBED BY THE NATIONAL SAFETY COUNCIL.

B. INSTRUCTIONAL AREAS

1. DETERMINING SUITABLE WORK CLOTHING
    - A. PROTECTING THE SKIN FROM HOT MATERIALS AND WELDING RAYS
    - B. CHECKING FOR LOOSE CLOTHING
2. PROVIDING SUITABLE EYE PROTECTION
    - A. SELECTING HELMETS AND COLORED LENSES FOR WELDING
    - B. GOGGLES AND FACE MASKS TO PREVENT DAMAGE FROM FLYING MATERIALS
3. SELECTING SUITABLE EAR PLUGS TO REDUCE NOISE
4. SELECTING FIRST AID MATERIALS
5. DETERMINING AND CORRECTING FIRE HAZARDS
    - A. SELECTING AND LOCATING FIRE EXTINGUISHERS
    - B. STORING FLAMMABLE MATERIALS
6. DETERMINING AND USING SAFE WORK PRACTICES WITH HAND TOOLS
    - A. SELECTING AND USING TOOLS WITH WOOD HANDLES
        - (1) HAMMERS
        - (2) AXES
        - (3) FILES
    - B. SELECTING AND USING PROPER KIND AND SIZE OF WRENCHES
    - C. SELECTING AND USING PUNCHES AND CHISELS
        - (1) DRESSING MUSHROOM HEADS
        - (2) SHARPENING CUTTING EDGES
    - D. SELECTING AND USING TOOLS WITH CUTTING EDGES
7. DETERMINING AND USING SAFE PRACTICES WITH POWER TOOLS
    - A. SELECTION AND USE OF GROUNDING CORDS AND PLUGS ON ALL POWER EQUIPMENT

   B. SELECTION AND USE OF EXTENSION CORDS

   C. SELECTION AND USE OF FUSES OF PROPER SIZE

   D. SELECTION AND USE OF BELT AND BLADE GUARDS

   E. DETERMINING SAFETY HAZARDS OF CUTTING EDGES

   F. SELECTING AND USING SAFETY PROCEDURES IN OPERATING POWER EQUIPMENT

8. DETERMINING AND USING SAFE PRACTICES IN WELDING

   A. SELECTION AND USE OF CLOTHING TO AVOID BURNS

   B. SELECTION AND USE OF SUITABLE EYE PROTECTION

   C. SELECTION AND USE OF EQUIPMENT TO AVOID FIRE

   D. CHECKING FOR GAS LEAKS WITH SOAP AND BRUSH

   E. SETTING GAUGES FOR REGULATING PRESSURE FOR GAS WELDING

9. DETERMINING AND USING SAFE PRACTICES FOR SERVICING AND REPAIRING AGRICULTURAL MACHINERY

   A. SELECTION AND USE OF HAND TOOLS

   B. SELECTION AND USE OF HOISTS, JACKS AND OTHER SUPPORTS

10. USING COLOR CODING FOR SAFETY

   A. DETERMINING AREA AND COLOR TO USE

   B. DETERMINING EQUIPMENT PART COLOR

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS VIEW SLIDES, PICTURES OR OTHER VISUALS ILLUSTRATING SHOP WORK PROCEDURES AND PRACTICES. THEN HAVE EACH STUDENT PREPARE A LIST DESCRIBING SUITABLE CLOTHING, EYE AND EAR PROTECTION AND WORK HABITS FOR THE STUDIED ILLUSTRATIONS.

2. A. HAVE STUDENTS VISIT AN AGRICULTURAL MECHANICS SHOP OR SERVICE CENTER AND PREPARE A LIST OF FIRE HAZARDS; DETERMINE KIND OF FIRE EXTINGUISHER AND LOCATE THEM IN THE PROPER PLACE.

B. HAVE STUDENTS PREPARE A LIST OF FLAMMABLE MATERIALS USED IN THE SHOP AND SELECT SUITABLE STORAGE AREA AND PROCEDURES FOR THEM.

3. A. SHOW STUDENTS UNSAFE HAND TOOLS AND HAVE THEM DESCRIBE THE HAZARDS AND HOW THEY WOULD PROCEED TO CORRECT THEM.

   B. HAVE STUDENTS DEMONSTRATE SAFE PROCEDURES IN USING HAND TOOLS.

4. A. HAVE STUDENTS DESCRIBE SAFETY HAZARDS IN USING POWER EQUIPMENT.

   B. HAVE STUDENTS DEMONSTRATE USING POWER EQUIPMENT SAFELY.

5. HAVE STUDENTS VIEW SLIDES, EXAMINE REFERENCES OR BOTH REGARDING WELDING PRACTICES AND PREPARE A LIST OF SAFETY PRACTICES AND PROCEDURES TO FOLLOW FOR PROTECTIVE CLOTHING, EQUIPMENT AND FIRE PREVENTION.

6. HAVE STUDENTS OBSERVE A TRACTOR OR OTHER PIECE OF FARM MACHINERY IN THE PROCESS OF REPAIR AND DESCRIBE THE SAFETY PRACTICES THAT SHOULD BE FOLLOWED.

7. FROM SLIDES, PICTURES OR ACTUAL OBSERVATION OF A FARM MECHANICS SHOP, HAVE STUDENTS PREPARE A DIAGRAM OF THE SHOP AND LABEL ALL COLORS ACCORDING TO RECOMMENDED SAFETY COLOR CODES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING SLIDES, PICTURES OR OTHER VISUAL AIDS, HAVE STUDENTS SELECT ITEMS REGARDING PERSONAL PROTECTION THAT ARE SAFETY HAZARDS AND ITEMS THAT COMPLY WITH APPROVED SAFETY RECOMMENDATIONS WITH 95 % ACCURACY.

2. A. PROVIDE STUDENTS WITH A LIST OF FIRE HAZARDS IN A FARM SHOP; HAVE THEM SELECT METHODS FOR CORRECTION.

   B. PROVIDE STUDENTS WITH A LIST OF DIFFERENT TYPES OF FIRES AND HAVE THEM SELECT THE PROPER TYPE OF FIRE EXTINGUISHER TO USE BASED UPON CRITERIA STUDIED IN CLASS WITH COMPLETE ACCURACY.

3. HAVE EACH STUDENT DEMONSTRATE THE CORRECT USE OF THE COMMON HAND TOOLS USED IN THE FARM MECHANICS SHOP.

4. HAVE EACH STUDENT DEMONSTRATE THE CORRECT USE OF POWER TOOLS IN THE FARM MECHANICS SHOP.

5. HAVE STUDENTS PREPARE A LIST OF EQUIPMENT AND CLOTHING REQUIRED FOR SAFE WELDING USE AND FIRE HAZARDS THAT MAY OCCUR.

6. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING THE SERVICING AND REPAIR OF A TRACTOR AND HAVE THEM LIST THE SAFETY PRECAUTIONS TO FOLLOW.

7. HAVE STUDENTS DIAGRAM THE INTERIOR OF A FARM SHOP OR SERVICE CENTER INCLUDING EQUIPMENT AND LABEL AREAS AND ITEMS FOR THE CORRECT SAFETY COLOR CODE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUALS SHOWING SAFETY HAZARDS OR SAFE PROCEDURES

2. SAMPLES OF UNSAFE TOOLS

3. SAMPLES OF FIRE EXTINGUISHERS

4. SAMPLES OF EYE AND EAR PROTECTION EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. PLANNING AND EQUIPPING A SERVICE CENTER FOR YOUR FARM. AMES, IOWA: COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY. 1972.

   THIS REFERENCE PROVIDES INFORMATION ON COLOR CODES AND OTHER SAFETY SUGGESTIONS.

2. SAFETY IN THE AGRICULTURAL MECHANICS SHOP. VAS 3022. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1967, 24 PAGES.

   THIS REFERENCE GIVES SPECIFIC INFORMATION ON MANY AREAS OF SAFETY IN THE FARM MECHANICS SHOP.

ELECTRIC WELDING IN AGRICULTURAL MECHANICS

UNIT CONCEPT: IN USING THE ELECTRIC WELDER TO REPAIR AGRICULTURAL EQUIPMENT, A PERSON MUST PAY PARTICULAR ATTENTION TO THE COMPOSITION OF THE METALS BEING WELDED, THE TYPE OF JOINT BEING WELDED, THE WELDING TECHNIQUES, THE SELECTION OF ELECTRODES, THE CONTROL OF DISTORTION AND SAFE OPERATING PROCEDURES TO PRODUCE A WELD OF SUFFICIENT STRENGTH UNDER VARIOUS OPERATING CONDITIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. PROVIDED VARIOUS TYPES OF MATERIALS TO BE WELDED, CORRECTLY IDENTIFY THE TYPE OF METAL BY USING SIGHT, TEXTURE, AND/OR SPARK TEST RESULTS.

2. RUN BEADS IN VARIOUS POSITIONS BY SELECTING THE PROPER ELECTRODE, MAINTAINING THE PROPER ARC LENGTH, SELECTING THE PROPER CURRENT SETTING, MAINTAINING PROPER SPEED OF TRAVEL AND PROPER ELECTRODE ANGLE.

3. GIVEN THE METALS TO BE WELDED AND APPROPRIATE WELDING EQUIPMENT, FOLLOW AND EXHIBIT SAFE OPERATING PROCEDURES FOR ARC WELDING TO PREVENT INJURY TO STUDENTS OR DAMAGE TO THE WELDING EQUIPMENT.

4. GIVEN METALS TO BE WELDED AND THE APPROPRIATE WELDING EQUIPMENT, PREPARE THE METAL AND MAKE LAP, FILLET, AND BUTT WELDS IN THE FLAT, HORIZONTAL, VERTICAL, AND OVERHEAD POSITIONS THAT WILL NOT BREAK UNDER THE OPERATING CONDITIONS OF THE EQUIPMENT BEING REPAIRED.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE METALS THAT MAY BE WELDED BY USING THE ARC WELDER

    A. IDENTIFYING BY SIGHT AND TEXTURE THE DIFFERENT KINDS OF IRON, STEEL, AND OTHER METALS SUCH AS ALUMINUM, BRASS, COPPER, AND ZINC-TIN COMBINATIONS (POT METAL) USED IN MAKING VARIOUS MACHINERY PARTS

(1) EXAMINING THE NATURE OF THE BREAK AND TYPE OF BREAK
(2) COLOR OF THE GRAIN
(3) LISTENING TO THE RING OF THE METAL
(4) TEXTURE OF THE METAL

B. IDENTIFYING FERROUS METALS USED IN MAKING EQUIPMENT PARTS BY USING THE SPARK TEST

C. DETERMINING HOW THE VARIOUS METALS MAY BE WELDED

2. PREPARING THE METAL FOR WELDING

A. PRACTICES TO FOLLOW IN CLEANING THE METAL FOR WELDING

(1) REMOVING EXCESSIVE DIRT AND GREASE
(2) REMOVING RUST

B. PROCEDURES TO FOLLOW IN PREPARING AND FITTING THE CLEANED PIECES FOR WELDING

C. DETERMINING THE KIND OF JOINT AND WELD TO BE USED FOR A SPECIFIC SITUATION

D. PRACTICES TO FOLLOW IN "SETTING-UP" THE METALS TO BE WELDED TO CONTROL FOR EXPANSION AND CONTRACTION OF METAL AND MINIMIZE DISTORTION

(1) POSITIONING THE METAL
(2) SECURING THE METAL IF NECESSARY

3. PREPARING AND OPERATING THE WELDING EQUIPMENT AND USING THE ACCESSORIES NEEDED FOR MAKING A WELD

A. SELECTING THE ELECTRODE TO BE USED FOR MAKING A WELD

(1) FACTORS TO BE CONSIDERED
(2) PURPOSE OF ELECTRODE AND COMPOSITION OF ELECTRODE
(3) IDENTIFYING ELECTRODES AS CODED BY THE AMERICAN WELDING SOCIETY

B. ADJUSTING THE CURRENT ON THE ARC WELDER FOR MAKING A WELD

(1) FACTORS THAT NEED TO BE CONSIDERED IN SETTING THE AMPERAGE
(2) SETTING THE AMPERAGE ON VARIOUS WELDERS

C. SAFETY PRECUATIONS THAT NEED TO BE CONSIDERED IN USING ARC WELDING EQUIPMENT

(1) PERSONAL SAFETY PRACTICES TO FOLLOW
(2) PREVENTING FIRES IN THE WELDING AREA
(3) INSPECTING THE EQUIPMENT AND SURROUNDING AREA FOR POTENTIAL HAZARDS

4. WELDING VARIOUS KINDS OF JOINTS IN VARIOUS POSITIONS

A. GENERAL PRECAUTIONS TO OBSERVE AND PRACTICES TO FOLLOW IN MAKING A "STRONG" WELD AND MINIMIZING WELD DEFECTS

(1) STARTING THE ARC
(2) DETERMINING WHAT FACTORS INFLUENCE THE STRENGTH OF A WELD
(3) RUNNING A BEAD

    (A) MAINTAINING PROPER LENGTH OF ARC
    (B) MAINTAINING PROPER FORWARD TRAVEL

(4) RE-ESTABLISHING A BEAD
(5) DETERMINING WHAT INFLUENCE HEAT HAS ON METAL AND TAKING STEPS TO PREVENT DISTORTION

B. PRACTICES TO FOLLOW IN MAKING A WELD IN THE FLAT POSITION

C. PRACTICES TO FOLLOW IN MAKING WELDS IN THE VERTICAL POSITION

D. PRACTICES TO FOLLOW IN MAKING WELDS IN THE OVERHEAD POSITION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. IDENTIFY VARIOUS KINDS OF METAL THAT MAY BE FOUND ON AGRICULTURAL EQUIPMENT. THE STUDENTS SHOULD INSPECT THE GRAIN OR TEXTURE OF THE METAL, THE COLOR OF THE METAL, AND USE A GRINDER TO CONDUCT A SPARK TEST. THE TEACHER SHOULD DEVELOP A DEMONSTRATION BOARD WHICH HAS THE VARIOUS KINDS OF METALS IDENTIFIED WHICH THE STUDENTS COULD USE AS A REFERENCE TO CHECK THEIR OWN IDENTIFICATION RESULTS.

2. A. RUN A SERIES OF 3" LONG BEADS ON 1/4" METAL. THE STUDENTS SHOULD RUN A BEAD FOR EACH OF THE FOLLOWING CONDITIONS TO DETERMINE WHAT EACH CONDITION HAS ON THE QUALITY OF THE WELD: 1) IMPROPER AMPERAGE SETTING, 2) IMPROPER ARC LENGTH, 3) IMPROPER SPEED OF TRAVEL, AND 4) IMPROPER ELECTRODE ANGLE.

B. PRACTICE RUNNING 3-5" LONG BEADS ON VARIOUS THICKNESSES OF METAL IN VARIOUS POSITIONS BEING SURE TO MAINTAIN PROPER ARC LENGTH ELECTRODE ANGLE, SPEED OF TRAVEL, AND USE THE PROPER AMPERAGE SETTING.

3. HAVE THE STUDENTS CHECK THE WELDING AREA, AND PERSONAL DRESS OF EACH STUDENT IN THE WELDING AREA FOR ANY POTENTIAL SAFETY HAZARDS WHICH SHOULD BE CORRECTED.

4. A. CLEAN AND PREPARE 1/4" METAL FOR WELDING A BUTT WELD IN THE FLAT POSITION.

B. WELD A BUTT WELD IN THE FLAT POSITION USING A 1/4" THICKNESS COPPER STRIP AS A BACK-UP STRIP WHERE IT IS NOT POSSIBLE TO GET A GOOD FIT-UP OF METALS TO BE WELDED AND THE JOINT HAS A LARGE GAP.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PREPARE EXAMPLES OF SOME OF THE MORE COMMON KINDS OF METAL THAT ARE FOUND ON AGRICULTURAL EQUIPMENT. HAVE THE STUDENTS IDENTIFY THE METAL BY NAME AND INDICATE WHETHER IT CAN BE WELDED USING AN ARC WELDER. EVALUATE THE STUDENT BY CONSIDERING WHETHER THE METAL HAS BEEN NAMED CORRECTLY AND WHETHER IT CAN BE WELDED OR NOT WELDED WITH THE ARC WELDER.

2. THE STUDENTS SHOULD SUBMIT FOR EVALUATION FIVE 3" LONG BEADS ON 1/4" THICKNESS METAL. THE TEACHER SHOULD EVALUATE THE BEADS CONSIDERING THE FACTORS SUCH AS AMPERAGE SETTING, LENGTH OF ARC, SPEED OF TRAVEL, AND ANGLE OF ELECTRODE.

3. DEVELOP A "TRUE OR FALSE" SAFETY QUIZ ON ARC WELDING FOR THE STUDENTS TO COMPLETE. EVALUATE THE STUDENT'S PERFORMANCE ON THE BASIS OF COMPLETING THE TEST AT A CERTAIN LEVEL OF PERFORMANCE ESTABLISHED BY THE LOCAL TEACHER.

4. THE STUDENTS SHOULD SUBMIT FOR EVALUATION A LAP WELD MADE IN THE FLAT POSITION USING TWO PLATES OF 3/16" THICKNESS METAL. THE TEACHER SHOULD EVALUATE THE STUDENT'S WORK ON THE BASIS OF THE AMOUNT OF SPATTER, THE DEGREE OF UNDERCUTTING, THE DEGREE OF OVERLAP, AND THE STRENGTH OF THE WELD.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. DIFFERENT TYPES OF METAL OF VARYING THICKNESS FOR THE STUDENTS TO WORK ON

2. A SUFFICIENT NUMBER OF ARC WELDERS AND BOOTHS FOR THE STUDENTS TO USE WITH ADEQUATE VENTILATION SYSTEM(S)

3, ARC WELDING ACCESSORIES INCLUDING GLOVES, WIRE BRUSH, GROUND CLAMP, ELECTRODE WELDING APRONS, WELDING TABLES, AND GRINDER

4. CHARTS SHOWING THE CLASSIFICATION OF ELECTRODES, WHICH ELECTRODES TO USE IN VARIOUS SITUATIONS AND HOW TO DETERMINE THE AMPERAGE SETTING

5. A DISPLAY BOARD WHICH HAS VARIOUS METALS IDENTIFIED

6. A DISPLAY OF VARIOUS TYPES OF WELDS SHOWING BOTH "GOOD" AND "BAD" WELDS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ARC WELDING. VAS 3004. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1957, 40 PAGES.

   WELL ILLUSTRATED, THIS PUBLICATION COVERS A VAST ARRAY OF AREAS IN ARC WELDING WHICH THE STUDENT CAN READ IN A SHORT PERIOD OF TIME.

2. BALL, TOM. SOURCE UNIT IN ARC WELDING. DENVER, COLORADO: DEPARTMENT OF VOCATIONAL EDUCATION, COLORADO STATE UNIVERSITY. 1970, 59 PAGES.

   PRIMARILY A TEACHER'S REFERENCE, IT INCLUDES VARIOUS EXERCISES FOR STUDENTS AND A GENERAL OUTLINE OF STUDY QUESTIONS FOR STUDENT MOTIVATION.

3. FARM ARC WELDING PROCEDURES. COLLEGE STATION, TEXAS: VOCATIONAL INSTRUCTIONAL MATERIALS, TEXAS A & M UNIVERSITY. 49 PAGES.

   MOST HELPFUL AS A TEACHER'S REFERENCE, THIS PUBLICATION SUGGESTS VARIOUS PROCEDURES AND EXERCISES THAT TEACHERS MAY USE IN TEACHING ARC WELDING.

4. PHIPPS, LLOYD J. FARM MECHANICS TEXT AND HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1964, PP. 241-278.

THIS REFERENCE COVERS THE BASIC WELDING OPERATIONS IN A MANNER THAT STUDENTS WILL FIND EASY TO UNDERSTAND.

5. TEACHERS MANUAL: ARC WELDING INSTRUCTIONS FOR THE BEGINNER. CLEVELAND, OHIO: THE JAMES F. LINCOLN ARC WELDING FOUNDATION. 1964, 58 PAGES.

OF MOST VALUE TO THE INSTRUCTOR, THIS PUBLICATION COVERS THE VARIOUS AREAS OF ARC WELDING AND INCLUDES SUGGESTED DEMONSTRATIONS WHICH THE TEACHER WILL FIND USEFUL IN STRESSING VARIOUS CONCEPTS.

OXY-ACETYLENE WELDING AND CUTTING

UNIT CONCEPT: THE REPAIR OF AGRICULTURAL EQUIPMENT BY A PERSON USING THE OXY-ACETYLENE WELDING EQUIPMENT NECESSITATES THAT IT BE OPERATED SAFELY AND THAT THE PERSON UNDERSTAND THE PROPERTIES OF THE METALS TO BE WELDED, THE TYPES OF FLAMES TO BE USED AND THE TYPE OF FILLER RODS TO BE USED IN MAKING A WELD THAT WILL WITHSTAND STRESS UNDER VARIOUS OPERATING CONDITIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. PROVIDED THE APPROPRIATE OXY-ACETYLENE WELDING EQUIPMENT AND PIECES OF STEEL OR CAST IRON OF VARIOUS THICKNESSES, CUT STEEL WELL ENOUGH THAT THE PIECE FITS ITS INTENDED PURPOSE.

2. PROVIDED THE APPROPRIATE OXY-ACETYLENE WELDING EQUIPMENT, PROPERLY CONNECT AND INSPECT THE OXY-ACETYLENE WELDING EQUIPMENT, LIGHT, ADJUST AND TURN OFF THE FLAME, OBSERVING SAFE PROCEDURES AND CARE OF THE EQUIPMENT, TO THE SATISFACTION OF THE TEACHER.

3. PROVIDED THE APPROPRIATE OXY-ACETYLENE WELDING EQUIPMENT AND PIECES OF STEEL OR CAST IRON OF VARYING THICKNESSES, BRAZE (BRONZE WELD) THE METALS USING THE APPROPRIATE ROD REQUIRED FOR THE JOB.

4. PROVIDED THE APPROPRIATE OXY-ACETYLENE WELDING EQUIPMENT AND VARIOUS PIECES OF STEEL OR CAST IRON, FUSION WELD THE METALS BY EITHER USING A FILLER ROD OR NOT USING A FILLER ROD TO ACHIEVE SUFFICIENT STRENGTH FOR THE USE OF THE FUSED MATERIALS.

5. PROVIDED THE APPROPRIATE OXY-ACETYLENE WELDING EQUIPMENT AND PIECES OF STEEL, HEAT AND BEND THE METAL TO FIT A SPECIFIC SITUATION.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE METALS TO BE WELDED WITH OXY-ACETYLENE WELDER

A. IDENTIFYING METALS BY SIGHT AND TEXTURE

   (1) EXAMINING THE NATURE OF THE BREAK AND THE TYPE OF BREAK
   (2) COLOR OF THE GRAIN
   (3) TEXTURE OF THE METAL
   (4) LISTENING TO THE RING OF THE METAL

B. IDENTIFYING METALS BY USING THE SPARK TEST

C. DETERMINING HOW THE VARIOUS METALS MAY BE WELDED

2. PREPARING THE METALS FOR WELDING OR CUTTING

   A. CLEANING THE METALS TO BE WELDED

      (1) REMOVING EXCESSIVE DIRT AND GREASE
      (2) REMOVING RUST

   B. PROCEDURES TO FOLLOW IN PREPARING AND FITTING THE METALS FOR WELDING

   C. DETERMINING THE KIND OF WELD OR JOINT TO BE USED FOR A SPECIFIC SITUATION

   D. PROCEDURES TO FOLLOW IN "SETTING-UP" THE METALS TO BE WELDED TO CONTROL FOR EXPANSION AND CONTRACTION OF THE METAL AND TO MINIMIZE DISTORTION

      (1) POSITIONING THE METAL
      (2) SECURING THE METAL IF NECESSARY

3. SETTING UP AND TESTING THE OXY-ACETYLENE WELDING EQUIPMENT

   A. PROCEDURES TO OBSERVE IN SETTING UP THE OXY-ACETYLENE WELDING EQUIPMENT

      (1) SETTING UP FOR WELDING
      (2) SETTING UP FOR CUTTING

   B. PROCEDURES TO FOLLOW IN TESTING THE SYSTEM FOR LEAKS AND SERVICING THE SYSTEM WHEN LEAKS OCCUR

      (1) TIGHTENING THE CONNECTIONS AND TESTING THE SYSTEM
      (2) REPLACING ANY DEFECTIVE PARTS

   C. PROCEDURES TO FOLLOW IN MAINTAINING THE OXY-ACETYLENE WELDING EQUIPMENT

      (1) CLEANING THE TIPS
      (2) REPLACING "O" RINGS ON TIPS AND BLOWPIPES

D. SAFETY PRECAUTIONS TO FOLLOW WHEN WORKING WITH OXY-ACETYLENE WELDING EQUIPMENT

(1) INSPECTING THE WORK AREA FOR POTENTIAL HAZARDS
(2) PERSONAL SAFETY PRECAUTIONS TO OBSERVE

4. OPERATING THE OXY-ACETYLENE WELDER

A. PROCEDURES TO FOLLOW IN LIGHTING THE BLOWPIPE AND EXTINGUISHING THE FLAME

B. ADJUSTING THE FLAME FOR WELDING OR CUTTING VARIOUS METALS AND FOR DIFFERENT PURPOSES

C. PROCEDURES TO FOLLOW IN SHUTTING OFF THE OXY-ACETYLENE WELDING EQUIPMENT

5. USING THE OXY-ACETYLENE WELDER FOR CUTTING METAL

A. PREPARING THE METAL TO BE CUT

B. PROCEDURES TO FOLLOW IN STARTING AND MAKING A CUT OR BEVEL

C. RECOGNIZING SYMPTOMS OF A POOR CUT OR BEVEL AND MAKING ADJUSTMENTS TO PREVENT SUCH SYMPTOMS FROM OCCURRING

6. BENDING AND SHAPING METAL

A. SELECTING THE TIP AND ADJUSTING THE FLAME

B. HEATING THE METAL

C. BENDING THE METAL TO THE DESIRED SHAPE USING APPROPRIATE TOOLS

7. USING THE OXY-ACETYLENE WELDER FOR MAKING VARIOUS WELDS IN DIFFERENT POSITIONS

A. GENERAL PRECAUTIONS TO OBSERVE IN MAKING A "STRONG" WELD AND MINIMIZING WELD DEFECTS

B. PRACTICES TO FOLLOW IN FUSION WELDING VARIOUS TYPES OF JOINTS IN VARIOUS POSITIONS USING MILD STEEL

C. PRACTICES TO FOLLOW IN FUSION WELDING CAST IRON

D. PRACTICES TO FOLLOW IN BRONZE WELDING VARIOUS TYPES OF JOINTS IN DIFFERENT POSITIONS USING MILD STEEL

E. PRACTICES TO FOLLOW IN BRONZE WELDING CAST IRON

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS MAKE A 90° CUT AND A 45° BEVEL CUT IN 3/16" STEEL PLATE. THE STUDENTS WILL NEED TO CHECK CUTTING CHARTS TO DETERMINE THE CUTTING TIP SIZE TO BE USED AND THE PROPER SETTING FOR OXYGEN PRESSURE.

2. HAVE THE STUDENTS CONNECT THE HOSES, CONNECT THE WELDING OR CUTTING BLOWPIPE, PRACTICE LIGHTING THE BLOWPIPE, ADJUSTING THE OXY-ACETYLENE FLAME, AND EXTINGUISHING THE OXY-ACETYLENE FLAME.

3. HAVE THE STUDENTS PREPARE TWO PIECES OF 1/4" CAST IRON FOR BRAZING. HAVE THE STUDENTS BRONZE WELD A BUTT JOINT IN THE CAST IRON AND TEST THE WELD.

4. HAVE THE STUDENTS MAKE A BUTT WELD USING TWO PIECES OF STEEL ABOUT 1/8" THICK. AFTER THE TWO ENDS HAVE BEEN TACKED TOGETHER, HAVE THE STUDENTS USE FILLER ROD TO MAKE THE FUSION WELD.

5. HAVE THE STUDENTS BEND GIVEN PIECES OF 1/4" X 1" X 1" ANGLE IRON TO FORM A RIGHT ANGLE. THE STUDENTS WILL NEED TO REMOVE A PORTION OF THE ANGLE IRON AND HEAT THE METAL TO MAKE THE 90° ANGLE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. THE STUDENTS SHOULD SUBMIT FOR EVALUATION A 90° CUT MADE THROUGH 1/2" STEEL PLATE 6" LONG. THE TEACHER SHOULD EVALUATE THE STUDENT'S WORK BY CONSIDERING SUCH FACTORS AS THE STRAIGHTNESS OF THE CUT, THE ANGLE OF THE CUT, AND THE AMOUNT OF SLAG OR FUSED METAL ON THE UNDERSIDE OF THE CUT.

2. DEVELOP AN OBJECTIVE EXERCISE AND A "TRUE" OR "FALSE" EXERCISE FOR THE STUDENTS TO COMPLETE REGARDING THE ASSEMBLY, INSPECTION, LIGHTING, ADJUSTING, AND EXTINGUISHING OF THE OXY-ACETYLENE WELDING EQUIPMENT.

3. THE STUDENTS SHOULD SUBMIT FOR EVALUATION A BRONZE BUTT WELD USING 3/8" CAST IRON. THE TEACHER SHOULD EVALUATE THE STUDENT'S WORK ON THE BASIS OF THE DEGREE OF FUSION ON THE UNDERSIDE OF THE WELD, THE DEGREE TO WHICH THE VEE IS FILLED AND HAS A SLIGHT CROWN, THE DEGREE OF RIPPLING IN THE CROWN, AND WHETHER THE CAST IRON BREAKS OR THE WELD BREAKS WHEN TESTED.

4. THE STUDENTS SHOULD SUBMIT FOR EVALUATION A FUSION BUTT WELD USING 1/8" METAL 6" LONG. THE TEACHER SHOULD EVALUATE THE STUDENT'S WORK BY CONSIDERING SUCH FACTORS AS UNIFORM WIDTH, HEIGHT, RIPPLE, AND DEGREE OF PENETRATION ON THE UNDERSIDE OF THE WELD.

5. HAVE THE STUDENTS SUBMIT FOR EVALUATION A BRACE MADE FROM 3/16" STEEL WITH THE FOLLOWING SPECIFICATIONS: 1) 90° ANGLE, 2) 6" FROM ONE END OF THE BRACE TO THE BACK OF ADJOINING LEG, AND 3) 4 1/2" FROM ONE END OF THE BRACE TO THE BACK OF THE OTHER ADJOINING LEG.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. DIFFERENT TYPES OF METAL OF VARYING THICKNESS FOR THE STUDENTS TO WORK ON

2. A SUFFICIENT NUMBER OF OXY-ACETYLENE WELDERS IN THE WELDING AREA

3. OXY-ACETYLENE WELDING ACCESSORIES INCLUDING GLOVES, GOGGLES, CLAMPS, PLIERS, FRICTION IGNITERS, TIP CLEANERS, WELDING TABLES, WELDING RODS, AND TIPS OF VARIOUS SIZES FOR WELDING AND CUTTING.

4. VISES, HAMMERS, AND WIRE BRUSHES

5. CHARTS SHOWING TIPS SIZES TO USE AND PRESSURE SETTINGS TO USE FOR VARIOUS SITUATIONS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRIBUSINESS: METAL WORKING. MONTGOMERY, ALABAMA: AGRICULTURAL EDUCATION SERVICE, ALABAMA STATE DEPARTMENT OF EDUCATION. PP. 89-120.

   A STUDENT STUDY GUIDE, THIS PUBLICATION MAY BE USED AS A STUDENT WORKBOOK IN COVERING ALL AREAS OF OXY-ACETYLENE WELDING. STUDY QUESTIONS ARE PROVIDED AND ACTIVITIES SUGGESTED THAT THE STUDENT MAY COMPLETE.

2. BALL, TOM. SOURCE UNIT IN OXY-ACETYLENE WELDING. DENVER, COLORADO: DEPARTMENT OF VOCATIONAL EDUCATION, COLORADO STATE UNIVERSITY. 1970, 59 PAGES.

   BASICALLY A TEACHER'S REFERENCE, THIS PUBLICATION INCLUDES VARIOUS EXERCISES FOR STUDENTS AND A GENERAL OUTLINE OF THE STUDY AREA TO BE TAUGHT.

3. OXY-ACETYLENE WELDING AND CUTTING. VAS 3001. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1971, 28 PAGES.

   THIS PUBLICATION COVERS THE BASIC OPERATIONS OF OXY-ACETYLENE WELDING IN A CONCISE MANNER THAT STUDENTS WILL FIND RELATIVELY EASY TO UNDERSTAND. INCLUDED ARE ILLUSTRATIONS THAT EMPHASIZE IMPORTANT POINTS IN MAKING VARIOUS WELDS.

4. PHIPPS, LLOYD J. FARM MECHANICS TEXT AND HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. PP. 279-310.

   THIS REFERENCE COVERS THE BASIC OXY-ACETYLENE WELDING OPERATIONS, AND IT LISTS THE VARIOUS STEPS THAT SHOULD BE OBSERVED FOR USING THE OXY-ACETYLENE WELDERS SAFELY.

5. WELDING AND CUTTING MANUAL: HOW TO USE YOUR OXY-ACETYLENE OUTFIT. NEW YORK, NEW YORK: UNION CARBIDE CORPORATION, DIVISION OF LINDE COMPANY. 1949, 208 PAGES.

   WELL ILLUSTRATED, THIS PUBLICATION COVERS IN DEPTH THE VARIOUS ASPECTS OF OXY-ACETYLENE WELDING. HOWEVER, THE STUDENT WILL FIND THAT THIS IS RELATIVELY EASY TO UNDERSTAND.

METAL WORK

UNIT CONCEPT: SEVERAL AGRICULTURAL CONSTRUCTION AND MAINTENANCE JOBS INVOLVE WORKING WITH METAL. THESE JOBS, DEPENDING ON THE SITUATION, MAY BE DONE BY SOLDERING OR WORKING WITH HOT OR COLD METAL. NUMEROUS SKILLS ARE NEEDED IN PERFORMING THESE JOBS. THE STUDENT SHOULD BECOME PROFICIENT IN METAL WORK OPERATIONS IN ORDER TO PROVIDE MORE EFFICIENCY AND ECONOMY IN THE MECHANICAL PHASE OF THE FARM BUSINESS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH CONSTRUCTION OR MAINTENANCE JOBS WHICH REQUIRE PROCEDURES INVOLVING HOT METAL WORK, DETERMINE THE BEST PROCEDURE TO FOLLOW, AND PERFORM THE SKILLS REQUIRED ACCORDING TO APPROVED RECOMMENDATIONS, AND SHOW PROFICIENCY OF PERFORMANCE TO THE INSTRUCTOR'S SATISFACTION.

2. WHEN PRESENTED WITH CONSTRUCTION OR MAINTENANCE JOBS REQUIRING COLD METAL WORK OPERATIONS, DETERMINE THE BEST PROCEDURE TO FOLLOW, AND PERFORM THE REQUIRED SKILLS EFFICIENTLY ACCORDING TO APPROVED RECOMMENDATIONS, AND SHOW PROFICIENCY OF PERFORMANCE TO THE SATISFACTION OF THE INSTRUCTOR.

3. WHEN GIVEN SOLDERING JOBS INVOLVED WITH CONSTRUCTION AND MAINTENANCE OPERATIONS, SELECT THE KIND AND TYPE OF SOLDERING PROCEDURE TO USE, AND PERFORM THE SOLDERING SKILLS EFFICIENTLY ACCORDING TO APPROVED RECOMMENDATIONS WITH PROFICIENCY TO THE SATISFACTION OF THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. HOT METAL WORK

    A. USING THE FORGE

        (1) SELECTING SUITABLE FUEL FOR A COAL FORGE
        (2) LIGHTING THE FIRE

            (A) COAL
            (B) GAS

    - (3) PACKING A COAL FORGE FIRE
  - B. FORGING MILD STEEL
    - (1) CUTTING METAL USING THE ANVIL HARDY
    - (2) BENDING METAL
      - (A) MAKING CURVE BENDS
      - (B) MAKING SQUARE BENDS
    - (3) UPSETTING METAL
    - (4) DRAWING OUT METAL
    - (5) PUNCHING HOLES IN METAL
  - C. FORGING TOOL STEEL
    - (1) RESHAPING TOOLS MADE OF TOOL STEEL
      - (A) CHISELS
      - (B) PUNCHES
      - (C) SCREWDRIVERS
      - (D) PICKS OR MATTOCKS
    - (2) ANNEALING TOOL STEEL
    - (3) HARDENING AND TEMPERING TOOL STEEL
- 2. COLD METAL WORK
  - A. CUTTING METAL WHEN COLD
    - (1) USING TIN SNIPS
    - (2) USING THE COLD CHISEL
    - (3) USING THE HACK SAW
  - B. SMOOTHING METAL
    - (1) USING THE POWER GRINDER
    - (2) USING A FILE
  - C. MAKING HOLES IN METAL
    - (1) USING TWIST DRILLS
    - (2) USING A PUNCH
    - (3) ENLARGING HOLES
    - (4) REAMING AND COUNTERSINKING HOLES
  - D. CUTTING THREADS IN METAL
    - (1) SELECTING THE THREAD TYPE
      - (A) NATIONAL COARSE
      - (B) NATIONAL FINE

(C) MACHINE THREADS
(D) PIPE THREADS

(2) THREADING RODS OR BOLTS
(3) TAPPING THREADS IN A HOLE

E. BENDING COLD METAL

(1) MAKING SQUARE BENDS
(2) MAKING ROUND BENDS
(3) MAKING TWIST BENDS

F. RIVETING METAL

G. REMOVING BROKEN STUDS OR BOLTS

3. SOLDERING

A. PREPARING METAL FOR SOLDERING

(1) FITTING THE JOINT
(2) CLEANING THE METAL
(3) REMOVING A GALVANIZED COATING
(4) SELECTION AND USE OF FLUX

B. SELECTING KIND OF SOLDER TO USE

(1) USING BAR SOLDER
(2) USING WIRE SOLDER

(A) ACID CORE
(B) ROSIN CORE
(C) SOLID

C. SELECTING HEAT SOURCES FOR SOLDERING

(1) USING SOLDERING IRONS

(A) CLEANING THE IRON
(B) TINNING THE IRON

(2) USING THE SOLDERING GUN
(3) USING A TORCH

(A) PROPANE TORCH
(B) GASOLINE TORCH
(C) OXY-ACETYLENE

D. SELECTING SOLDERING PROCEDURE

(1) SOLDERING A JOINT
(2) SWEATING A PATCH

E. USING SPECIAL SOLDERING TECHNIQUES

(1) SILVER SOLDERING
(2) SWEAT-TYPE FITTINGS FOR COPPER PLUMBING
(3) STAINLESS STEEL
(4) ALUMINUM

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. IF APPLICABLE, HAVE STUDENTS PRACTICE LIGHTING A COAL-TYPE FORGE AND SHOW HOW COAL IS ARRANGED TO PRODUCE THE HOTTEST FIRE; OR, IF A GAS FORGE IS USED, HAVE STUDENTS PRACTICE LIGHTING AND ADJUSTING TO OBTAIN THE HOTTEST FLAME.

B. USING A PIECE OF MILD STEEL, HAVE STUDENTS PRACTICE HEATING IT AND THEN MAKE BENDS, UPSET, PUNCH HOLES AND DRAW OUT THE METAL. HAVE EACH STUDENT DETERMINE THE HEAT REQUIRED TO PERFORM THE BEST JOB.

C. BY USING A TOOL MADE OF TOOL STEEL NEEDING RESHAPING AND TEMPERING OR A PIECE OF NEW TOOL STEEL, HAVE STUDENTS PRACTICE HEATING, SHAPING, ANNEALING AND TEMPERING. HAVE EACH STUDENT DESCRIBE THE COLOR CHANGES OF THE METAL DURING THE TEMPERING PROCESS.

2. A. PROVIDE STUDENTS WITH APPROPRIATE PIECES OF METAL AND HAVE THEM MAKE PRACTICE CUTS USING TIN SNIPS, COLD CHISEL AND HAND AND POWER HACK SAWS. HAVE STUDENTS DETERMINE THE BEST TYPE OF TOOL TO USE IN EACH CUTTING SITUATION.

B. HAVE STUDENTS PRACTICE SMOOTHING THE ROUGH EDGES FROM METAL USING THE POWER GRINDER AND FILES. HAVE EACH STUDENT DETERMINE THE PROPER GRINDING WHEEL TO USE AND THE TYPE AND SIZE OF FILE MOST SUITABLE.

C. PROVIDE STUDENTS WITH METAL FOR PRACTICING CUTTING HOLES BY DRILLING, PUNCHING, ENLARGING, REAMING AND COUNTERSINKING. IN EACH SITUATION, HAVE STUDENTS DETERMINE THE CORRECT SIZE AND TYPE OF TOOL TO USE.

D. HAVE EACH STUDENT PRACTICE CUTTING INSIDE (TAPPING) AND OUTSIDE THREADS. HAVE THEM DETERMINE THE HOLE SIZE (DRILL) TO MAKE FOR TAPPING WITH A SPECIFIED TAP SIZE. HAVE THEM SELECT THE TYPE THREAD MOST SUITABLE FOR THE USE SITUATION.

E. USING A PIECE OF METAL, HAVE STUDENTS PRACTICE MAKING BENDS AND JOINING TWO PIECES OF METAL BY RIVETING. HAVE STUDENTS DETERMINE THE MOST SUITABLE KIND OF RIVET TO USE AND SELECT THE CORRECT SIZE OF HOLE TO MAKE.

F. DEMONSTRATE TO STUDENTS THE PROCEDURES TO FOLLOW IN REMOVING A BROKEN STUD, USING DRILLING PROCEDURES AND APPROPRIATE STUD REMOVAL TOOLS. HAVE STUDENTS PRACTICE REMOVAL OF BROKEN STUDS.

3. A. USING PIECES OF GALVANIZED AND UNGALVANIZED SHEET METAL, HAVE STUDENTS PRACTICE FITTING A JOINT, CLEANING, PREPARING AND SOLDERING THE JOINT. HAVE EACH STUDENT DETERMINE THE KIND OF SOLDER MOST SUITABLE AND SELECT THE MOST APPROPRIATE HEAT SOURCE. FOLLOWING THE SAME WORK PROCEDURE, HAVE THEM PRACTICE SWEATING A PATCH.

B. HAVE STUDENTS PRACTICE SWEATING A COPPER PLUMBING JOINT. EACH STUDENT IS TO DETERMINE THE CORRECT CLEANING PROCEDURE, KIND OF FLUX, SOLDER AND HEAT SOURCE.

C. HAVE A SKILLED REPAIRMAN DEMONSTRATE PROCEDURES FOR SOLDERING BY THE SILVER SOLDER PROCESS, STAINLESS STEEL AND ALUMINUM.

D. HAVE STUDENT PRACTICE MAKING THESE SPECIAL SOLDERING JOBS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PROVIDE STUDENTS WITH A LIST OF USEFUL PROJECTS THEY COULD MAKE INVOLVING THE FORGING PROCESS. USING MILD STEEL MATERIALS, HAVE EACH STUDENT SELECT A PROJECT AND DEMONSTRATE THROUGH THE FINISHED PROJECT HIS SKILL IN FORGING MILD STEEL METAL.

B. PROVIDE STUDENTS WITH A PUNCH OR CHISEL IN NEED OF RESHAPING OR A PIECE OF NEW TOOL STEEL. HAVE STUDENTS DEMONSTRATE THEIR SKILLS IN SHAPING, ANNEALING AND TEMPERING THE TOOL STEEL INTO SUITABLE WORKING TOOLS.

2. A. PROVIDE STUDENTS WITH A LIST FROM WHICH TO SELECT A PROJECT OR PROJECTS THAT, BY CONSTRUCTION, WILL DEMONSTRATE THEIR SKILLS IN CUTTING METAL, SMOOTHING METAL, CUTTING HOLES, BENDING, RIVETING AND CUTTING THREADS.

B. PRESENT STUDENTS WITH A PIECE OF METAL HAVING A BROKEN STUD; HAVE EACH STUDENT DEMONSTRATE THE PROPER TECHNIQUES FOR THE STUD REMOVAL.

3. A. PROVIDE STUDENTS WITH A LIST OF PROJECTS INVOLVING SOLDERING. HAVE EACH STUDENT SELECT A PROJECT OR PROJECTS WHEREBY THEY CAN DEMONSTRATE THEIR SOLDERING SKILLS.

B. PROVIDE STUDENTS WITH MATERIALS INVOLVING USING SILVER SOLDERING, ALUMINUM AND STAINLESS STEEL. HAVE THEM DEMONSTRATE THEIR SKILLS IN SOLDERING THESE MATERIALS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. NUMEROUS PIECES OF SHEET METAL, MILD STEEL AND TOOL STEEL
2. FORGE
3. GRINDER
4. HACK SAW AND SEVERAL TYPES AND SIZES OF BLADES
5. SEVERAL SIZES AND TYPES OF FILES
6. SOAPSTONE FOR MAKING METAL
7. STEEL WOOL PADS
8. TWIST DRILLS BY 32/NDS FROM 1/8" TO 1/2"
9. POWER DRILL
10. METAL VISE
11. SOLDERING IRONS, GUNS, PROPANE AND GASOLINE TORCHES
12. BAR SOLDER, WIRE SOLDER - SOLID CORE, ACID CORE AND ROSIN CORE, ALUMINUM AND SILVER SOLDER
13. SOLDERING FLUX
14. COPPER PLUMBING JOINTS AND PIPE

F. EXAMPLES OF SUPPORTING REFERENCES

1. <ins>FARM METAL WORK</ins>. VAS 3002. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1957, 21 PAGES.

   THIS REFERENCE GIVES DETAILED INFORMATION IN PERFORMING COLD AND HOT METAL WORK JOBS.

2. JOHNSON, C. E. <ins>FARM SHOP PLANS AND STUDENT NOTEBOOK</ins>. DANVILLE, ILLINOIS: INTERSTATE PRINTERS AND PUBLISHERS, INC. 1964.

   THIS REFERENCE GIVES PLANS FOR MANY PROJECTS INVOLVING METAL WORK, INCLUDING SOLDERING.

3. <ins>METALS AND WELDING IN AGRICULTURE - CONSTRUCTION AND MAINTENANCE</ins>. ST. PAUL, MINNESOTA: HOBAR PUBLICATIONS. 230 PAGES.

A DETAILED REFERENCE, THIS MATERIAL INCLUDES MEASURING DEVICES, PROJECT PLANNING, METALS, AND THE FARM AND AGRI-BUSINESS CENTER.

4. SOLDERING FOR HOME FARM AND SHOP APPLICATIONS. VAS 3027. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1968, 23 PAGES.

THIS REFERENCE GIVES DETAILED INSTRUCTIONS IN PERFORMING ALL TYPES OF SOLDERING.

PLUMBING

UNIT CONCEPT: THE PLANNING AND INSTALLATION OF AN ADEQUATE PLUMBING SYSTEM REQUIRES SPECIAL KNOWLEDGE AND TOOLS IF THE SYSTEM IS TO PROVIDE THE NEEDS OF HOME AND OTHER FARM BUILDINGS. THE PLUMBING SYSTEM MUST MEET WITH THE STATE, COUNTY OR LOCAL CODE REQUIREMENTS. IN ORDER TO PLAN AND INSTALL PLUMBING, THE STUDENT MUST HAVE A KNOWLEDGE AND ACQUIRE SKILLS FOR INSTALLATION OF PUMPS, PIPING, PIPE FITTINGS, FIXTURES AND SEWAGE DISPOSAL SYSTEMS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH SPECIFIC INFORMATION REGARDING THE WATER SUPPLY REQUIREMENTS OF THE FARM HOME AND FARMSTEAD AND THE KIND AND SIZE OF PUMPS AVAILABLE, SELECT AND INSTALL THE CORRECT SIZE AND KIND OF PUMP THAT WILL SUPPLY THE WATER REQUIREMENTS MOST EFFICIENTLY AND ECONOMICALLY ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND ELECTRIC AND PLUMBING CODES.

2. WHEN PRESENTED WITH THE SEWAGE AND OTHER WASTE DISPOSAL NEEDS OF THE FARM HOME, SELECT, LOCATE AND INSTALL THE MOST SUITABLE TYPE AND ADEQUATE SIZE SEWAGE DISPOSAL SYSTEM USING THE MOST ECONOMICAL AND EFFICIENT METHODS, AND COMPLYING WITH ALL SPECIFICATIONS OF THE LOCAL SANITATION ENGINEER.

3. WHEN GIVEN THE PROBLEM OF PIPING SEWAGE AND OTHER WASTE MATERIALS, SELECT AND INSTALL PIPE AND PIPE FITTINGS BY THE MOST ECONOMICAL AND EFFICIENT PROCEDURES ACCORDING TO PLUMBING CODE REQUIREMENTS AND APPROVED PLUMBING SPECIFICATIONS.

4. WHEN GIVEN THE PROBLEM OF PIPING HOT AND COLD WATER IN THE FARM HOUSE AND OTHER FARM BUILDINGS, SELECT AND INSTALL THE MOST SUITABLE KIND AND THE CORRECT SIZE OF PIPING, FITTINGS AND FIXTURES, ECONOMICALLY AND EFFICIENTLY, COMPLYING WITH PLUMBING CODES AND ACCORDING TO APPROVED PLUMBING WORK STANDARDS.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE WATER SUPPLY REQUIREMENTS
    - A. CALCULATING HOME REQUIREMENTS
    - B. CALCULATING LIVESTOCK REQUIREMENTS
    - C. CALCULATING IRRIGATION REQUIREMENTS
    - D. DETERMINING FIRE CONTROL REQUIREMENTS
2. SELECTION OF THE CORRECT SIZE WATER PUMP OR PUMPS
    - A. DETERMINING PUMP LOCATION
    - B. DETERMINING HEIGHT AND DISTANCE WATER IS PUMPED
    - C. DETERMINING GALLONS PER MINUTE SUPPLIED
3. DETERMINING KIND AND TYPE OF PUMP TO INSTALL
    - A. COMPARING PERFORMANCE OF PUMPS
    - B. COMPARING COSTS
    - C. DETERMINING EASE OF INSTALLATION
    - D. DETERMINING SERVICING AND REPAIR FEATURES
4. INSTALLING WATER PUMPS
    - A. CONSTRUCTION OF PUMP PIT
    - B. DETERMINING ELECTRICAL WIRING SIZE AND SWITCHES
    - C. INSTALLING STORAGE TANK
    - D. ADJUSTING PRESSURE TANK CONTROLS
5. DETERMINING SEWAGE AND OTHER WASTE DISPOSAL NEEDS
6. DETERMINING LOCATION OF DISPOSAL UNIT
    - A. DETERMINING SANITATION CODES
    - B. COMPARING LOCATION FOR INSTALLATION EASE
7. SELECTING TYPE OF DISPOSAL UNIT
    - A. COMPARING COSTS

B. COMPARING EASE OF CLEANING

C. COMPARING EASE OF INSTALLATION

8. SELECTION OF PIPING AND FITTINGS FOR SEWAGE AND WASTE DISPOSAL

A. DETERMINING PLUMBING CODE SPECIFICATIONS

B. COMPARING COSTS OF MATERIALS

C. COMPARING COSTS AND EASE OF INSTALLATION

9. INSTALLING PIPING AND FITTINGS FOR WASTE DISPOSAL

A. PLANNING THE SEWAGE AND WASTE DISPOSAL SYSTEMS

B. SELECTING CORRECT SIZE OF PIPING

C. SELECTING AND INSTALLING CLEANOUT, AIR VENT AND TRAP FITTINGS

D. JOINING PIPE AND FITTINGS

(1) PROCEDURES FOR CAST IRON PIPE
(2) PROCEDURES FOR VITROUS CLAY PIPE
(3) PROCEDURES FOR PLASTIC PIPE

10. PLANNING A LAYOUT OF THE WATER-PIPING SYSTEM

A. LOCATING FAUCETS AND SHUT-OFF VALVES

B. LOCATING FIXTURES

C. DETERMINING KIND AND NUMBER OF PIPE FITTINGS

11. DETERMINING PIPING AND FITTING SIZES

A. CALCULATING MAIN SUPPLY LINE SIZE

B. CALCULATING BRANCH SUPPLY LINE SIZES

12. SELECTION OF KIND OF PIPING

A. COMPARING EASE OF INSTALLATION AND TOOLS REQUIRED

B. DETERMINING SUITABILITY FOR CARRYING HOT WATER

C. DETERMINING SUITABILITY FOR UNDERGROUND INSTALLATION

D. DETERMINING CORROSION PROBLEMS

14. SELECTING WATER FIXTURES

    A. DETERMINING SIZE REQUIREMENTS

        (1) HOT WATER HEATER
        (2) WATER SOFTENER

    B. COMPARING COSTS

15. INSTALLING FIXTURES

    A. INSTALLING SHUT-OFF VALVES

    B. INSTALLING TRAPS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS VISIT A FARM WHERE A PLUMBING SYSTEM IS TO BE INSTALLED. HAVE EACH STUDENT MAKE AN INVENTORY OF ITEMS INVOLVING WATER USAGE.

    B. HAVE STUDENTS PRACTICE CALCULATING WATER SUPPLY REQUIREMENTS FOR USE NEEDS OF A FARM SITUATION.

    C. VISIT A PUMP SUPPLY PLACE OF BUSINESS AND HAVE STUDENTS OBTAIN INFORMATION REGARDING KINDS AND SIZES OF PUMPS, THEIR COSTS AND RECOMMENDATIONS FOR CONDITIONS UNDER WHICH THEY ARE USED INCLUDING CODE REQUIREMENTS.

    D. HAVE STUDENTS EXAMINE CATALOGUES DESCRIBING KINDS, SIZES AND COSTS OF WATER PUMPS AND WITH INFORMATION SUGGESTING USE SITUATIONS.

    E. HAVE STUDENTS DEVELOP A COMPARISON CHART GIVING MAKE, KIND, COST AND SUGGESTED USE SITUATION FOR WATER PUMPS.

    F. VISIT A FARM WHERE A WATER PUMP IS BEING INSTALLED OR HAVE A WATER PUMP SPECIALIST DISCUSS WITH STUDENTS THE PROCEDURES TO FOLLOW IN INSTALLATION.

2. A. HAVE THE COUNTY SANITARY ENGINEER PRESENT INFORMATION TO STUDENTS REGARDING CODE REGULATIONS FOR INSTALLING SEWAGE AND WASTE DISPOSAL SYSTEMS.

    B. HAVE STUDENTS VIEW SLIDES, PICTURES OR OTHER VISUALS SHOWING INSTALLATION OF SEWAGE DISPOSAL SYSTEMS.

    C. HAVE STUDENTS PRACTICE DIAGRAMMING THE SEWAGE DISPOSAL LAYOUT. HAVE THEM LABEL PIPE SIZES AND CALCULATE OVERALL SIZE OF THE SYSTEM TO USE.

3. A. HAVE STUDENTS PREPARE A COMPARISON CHART GIVING INFORMATION REGARDING KIND, COSTS AND RECOMMENDED USE SITUATIONS FOR SEWER PIPE AND FITTINGS.

   B. HAVE STUDENTS PRACTICE FITTING SEWER PIPE JOINTS USING DIFFERENT TYPES OF MATERIALS.

4. A. HAVE STUDENTS VISIT A PLUMBING SUPPLY PLACE OF BUSINESS. HAVE THE DEALER OR SALESPERSON PROVIDE STUDENTS WITH COSTS, KINDS OF MATERIALS USED IN PIPING AND NAMES OF FITTINGS AND FIXTURES AND WHERE THEY ARE USED.

   B. HAVE STUDENTS DIAGRAM THE LAYOUT FOR THE PLUMBING OF A WATER SUPPLY SYSTEM. INCLUDE IN THE DIAGRAM PIPING SIZES, LOCATE AND LABEL OF FITTINGS AND FIXTURES.

   C. HAVE STUDENTS PRACTICE MEASURING AND CUTTING PIPING MATERIALS AND INSTALLING FITTINGS TO THE PIPING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING THE WATER REQUIREMENTS FOR A FARM, THE WATER SUPPLY AND LOCATION, AND HAVE EACH STUDENT, FROM A LIST OF PUMPS GIVING DESCRIPTIONS OF EACH, SELECT THE PUMP AND DESCRIBE PROCEDURES FOR INSTALLATION.

2. FROM SPECIFIC INFORMATION PROVIDED REGARDING A SEWAGE DISPOSAL SITUATION, HAVE EACH STUDENT PREPARE A DIAGRAM OF THE DISPOSAL SYSTEM GIVING KIND AND SIZE OF PIPING AND FITTINGS AND SIZE OF THE DISPOSAL TANK AND BACK BED.

3. HAVE STUDENTS DEMONSTRATE ASSEMBLING SEWER FITTINGS TO PIPING USING DIFFERENT PIPING AND FITTING MATERIALS TO THE SATISFACTION OF THE INSTRUCTOR.

4. A. DISPLAY FOR STUDENT OBSERVATION EITHER THE ITEM OR PHOTOGRAPHS OF THE ITEM OF FITTINGS AND FIXTURES USED IN PLUMBING WATER SUPPLY SYSTEMS. HAVE THEM IDENTIFY EACH ITEM WITH 90% ACCURACY.

   B. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING THE HOT AND COLD WATER SUPPLY NEEDS OF A FARM SITUATION. HAVE STUDENTS DIAGRAM, TO THE SATISFACTION OF THE TEACHER, A SUPPLY SYSTEM INCLUDING IN THE DIAGRAM LABELING OF THE KIND AND SIZE OF PIPING, FITTINGS AND FIXTURES AND HOT AND COLD WATER LINES.

   C. HAVE STUDENTS DEMONSTRATE MEASURING, CUTTING AND ASSEMBLING PIPING AND INSTALLING FITTINGS FOR DIFFERENT PIPING MATERIALS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PLUMBING SUPPLY CATALOGUES
2. PLUMBING FITTINGS AND PIPING MATERIALS
3. SLIDES, PHOTOGRAPHS AND OTHER VISUAL AIDS SHOWING PLUMBING INSTALLATIONS
4. PIPE CUTTERS, REAMERS, WRENCHES
5. THREAD SEAL MATERIALS
6. PROPANE TORCH
7. STEEL WOOL, FLUX AND SOLDER

F. EXAMPLES OF SUPPORTING REFERENCES

1. HOW TO INSTALL HOMART PLUMBING. CHICAGO, ILLINOIS: SEARS, ROEBUCK AND COMPANY.

   THIS REFERENCE GIVES DETAILED INFORMATION ON PLANNING, CUTTING AND FITTING.

2. PLANNING FOR AN INDIVIDUAL WATER SYSTEM. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1973, 52 PAGES.

   THIS REFERENCE GIVES DETAILED INFORMATION IN PLANNING AND INSTALLING WATER SYSTEMS.

3. PLUMBING FOR THE HOME AND FARMSTEAD. FB 2213. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, SUPERINTENDENT OF DOCUMENTS. 20 PAGES.

   THIS REFERENCE PROVIDES INFORMATION ON PLANNING AND INSTALLING SEWAGE AND WATER SUPPLY PLUMBING SYSTEMS. NUMEROUS DIAGRAMS ARE PROVIDED.

4. PUMP FUNDAMENTALS AND PUMP FUNDAMENTALS NOTEBOOK. SENECA FALLS, NEW YORK: GOULD PUMPS, INC.

   GENERAL REFERENCE WHICH WOULD BE USEFUL FOR THE OBJECTIVE AND INSTRUCTIONAL AREAS OF THIS UNIT DEALING WITH PUMPS.

FINISHING AND PRESERVING MATERIALS, EQUIPMENT OR BUILDINGS

UNIT CONCEPT: THE SELECTION AND APPLICATION OF THE MOST SUITABLE FINISHING AND PRESERVING MATERIALS FOR FARM MACHINERY, BUILDINGS AND OTHER STRUCTURES (FEEDERS, RACKS, FENCES) WILL IMPROVE THE APPEARANCE AND EXTEND THE USEFUL LIFE. FINISHING AND PRESERVING MATERIALS SHOULD BE SELECTED AND APPLIED ECONOMICALLY AND EFFICIENTLY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH THE PROBLEM OF APPLYING A FINISHING AND PRESERVING MATERIAL FOR FARM MACHINERY, BUILDINGS OR OTHER STRUCTURES, SELECT THE KIND OF MATERIAL THAT COULD BE USED MOST ECONOMICALLY AND EFFICIENTLY ACCORDING TO EQUIPMENT AND BUILDING MANUFACTURERS' SPECIFICATIONS AND DIRECTIONS PROVIDED ON CONTAINERS OF FINISHING AND PRESERVING MATERIALS.

2. WHEN GIVEN THE PROBLEM OF APPLYING FINISHING AND PRESERVING MATERIALS TO FARM MACHINERY, BUILDINGS OR OTHER STRUCTURES, DETERMINE BEFORE APPLYING THE PREPARATION REQUIRED OF THE MACHINERY, BUILDING OR STRUCTURE TO OBTAIN AN EFFICIENT AND ECONOMICAL APPLICATION ACCORDING TO RECOMMENDATIONS OF PROFESSIONAL FINISHING AND PRESERVING MATERIAL APPLICATORS.

3. WHEN GIVEN THE PROBLEM OF APPLYING FINISHING AND PRESERVING MATERIALS TO FARM MACHINERY, BUILDINGS OR OTHER STRUCTURES, SELECT THE BEST METHOD OF APPLICATION TO USE THAT WILL PROVIDE ECONOMY AND EFFICIENCY IN THE APPLICATION PROCEDURE AND WILL BE APPLIED ACCORDING TO RECOMMENDATIONS OF THE PRODUCT MANUFACTURER AND APPLICATOR SPECIALISTS.

4. WHEN PROVIDED WITH A FINISHING AND PRESERVING MATERIAL FOR APPLICATION TO FARM MACHINERY, BUILDINGS OR OTHER STRUCTURES, DETERMINE HOW THE FINISHING AND PRESERVING MATERIAL SHOULD BE PREPARED PRIOR TO APPLYING ACCORDING TO THE METHOD SELECTED FOR APPLICATION AND THE MATERIAL MANUFACTURERS' SPECIFICATIONS.

B. INSTRUCTIONAL AREAS

1. SELECTION OF FINISHING AND PRESERVING MATERIALS
    - A. SELECTING MATERIALS FOR PRIMING MACHINERY, BUILDINGS AND OTHER STRUCTURES
        - (1) MATERIALS USED ON BARE METAL OR NEW WOOD
        - (2) WOOD INSECT PREVENTIVE MATERIALS (TERMITES, CARPENTER ANTS, POWDER POST BEETLES)
        - (3) RUST PREVENTIVE MATERIALS
    - B. SELECTING FINISHING COAT MATERIALS
        - (1) GLOSS FINISHES
        - (2) DULL FINISHES
        - (3) SELECTION OF COLOR
        - (4) FLOOR FINISHES TO PREVENT SLIPPING
    - C. COMPARING DURABILITY OF MATERIALS
    - D. COMPARING COSTS
    - E. COMPARING EASE OF PREPARATION AND APPLICATION OF MATERIALS
2. PREPARING FARM MACHINERY FOR APPLICATION OF FINISHING AND PRESERVING MATERIALS
    - A. SELECTION AND APPLICATION OF GREASE SOLVENTS
    - B. REMOVING RUST
    - C. REMOVING OLD FINISH
    - D. MASKING AREAS OF MACHINERY WHERE FINISHING AND PRESERVING MATERIALS IS NOT WANTED
    - E. APPLYING RUST INHIBITING MATERIALS
3. PREPARING BUILDINGS AND OTHER STRUCTURES FOR APPLICATION OF FINISHING AND PRESERVING MATERIALS
    - A. REMOVING DAMAGED FINISHING MATERIALS FROM WOOD BUILDINGS AND OTHER WOOD STRUCTURES
    - B. REPAIRING DAMAGED SECTIONS
    - C. CAULKING WOOD STRUCTURES
        - (1) WINDOWS
        - (2) NAIL HOLES

D. PREPARING METAL MATERIALS OF BUILDINGS

(1) METAL ROOFS
(2) METAL SIDING

E. PREPARING MASONRY MATERIALS OF BUILDINGS

(1) CONCRETE FLOORS
(2) MASONRY BLOCKS

4. SELECTING METHOD OF APPLYING FINISHING AND PRESERVING MATERIALS

A. DETERMINING THE ADVANTAGES AND DISADVANTAGES OF SPRAY PAINTING

(1) MATERIALS THAT CAN BE USED
(2) EQUIPMENT AND OTHER FACILITIES NEEDED
(3) TYPE OF FINISH OBTAINED
(4) TIME AND COST INVOLVED
(5) SITUATIONS MOST SUITABLE FOR USE

B. DETERMINING THE ADVANTAGES AND DISADVANTAGES OF BRUSH PAINTING

(1) SKILLS REQUIRED
(2) SELECTION OF BRUSHES
(3) COSTS AND TIME INVOLVED
(4) SITUATIONS MOST SUITABLE FOR USE

C. DETERMINING THE ADVANTAGES AND DISADVANTAGES OF ROLLER PAINTING

(1) SITUATION MOST APPLICABLE FOR USE
(2) COSTS AND TIME INVOLVED

5. SELECTING PROCEDURES FOR CLEANING EQUIPMENT

A. CLEANING SPRAY EQUIPMENT

B. CLEANING BRUSHES

6. PREPARING FINISHING AND PRESERVING MATERIALS FOR APPLICATION

A. DETEMINING VISCOSITY REQUIRED BASED ON APPLICATION METHOD AND MATERIAL

B. SELECTION OF THINNING MATERIALS

C. DETERMINING MIXING PROCEDURES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS VISIT FINISHING AND PRESERVING SUPPLY CENTERS FOR THE PURPOSE OF OBTAINING FROM THE DEALERS INFORMATION REGARDING MATERIALS FOR USE ON MACHINERY, BUILDINGS AND OTHER STRUCTURES.

   B. HAVE STUDENTS PREPARE AN INFORMATION SHEET LISTING FINISHING AND PRESERVING MATERIALS, THEIR COSTS, USES AND OTHER INFORMATION REGARDING DURABILITY AND METHODS AND EASE OF APPLICATION.

2. A. HAVE STUDENTS PREPARE A LIST OF MATERIALS AND PROCEDURES TO USE IN PREPARING FARM MACHINERY FOR APPLICATION OF FINISHING AND PRESERVING MATERIALS.

   B. HAVE STUDENTS PRACTICE REMOVAL OF RUST AND OLD FINISHES FROM FARM MACHINERY.

   C. HAVE STUDENTS DESCRIBE PROCEDURES FOR PREPARING A WOOD STRUCTURE FOR APPLICATION OF FINISHING AND PRESERVING MATERIALS INCLUDING PROCESSES TO FOLLOW FOR NEW WOOD STRUCTURES AS WELL AS PREVIOUSLY FINISHED ONES.

3. A. HAVE STUDENTS OBSERVE THE APPLICATION OF A FINISHING MATERIAL BEING APPLIED TO A FARM TRACTOR OR OTHER MACHINE BY THE SPRAY METHOD.

   B. HAVE STUDENTS PRACTICE THE APPLICATION OF FINISHING AND PRESERVING MATERIALS USING SPRAY EQUIPMENT.

   C. FROM A SELECTION OF BRUSHES, HAVE STUDENTS SELECT THOSE CONSIDERED MOST SUITABLE AND PRACTICAL FOR APPLYING A FINISHING MATERIAL.

   D. HAVE STUDENTS PREPARE A LIST OF SITUATIONS FOR USING FINISHING AND PRESERVING MATERIALS AND SELECT THE MATERIAL MOST SUITABLE FOR USE.

   E. HAVE STUDENTS PRACTICE CLEANING BRUSHES AND SPRAY PAINTING EQUIPMENT, DETERMINING THE MOST SUITABLE SOLVENTS TO USE.

4. PROVIDE STUDENTS WITH FINISHING AND PRESERVING MATERIALS AND HAVE THEM DESCRIBE THE THINNING MATERIALS TO USE FOR EACH MATERIAL AND THE MIXING PROCEDURES TO BE USED.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PREPARE A MATCHING TEST WITH ONE COLUMN CONTAINING THE NAMES OF FINISHING AND PRESERVING MATERIALS, AND THE

SECOND COLUMN A DESCRIPTION OF THE MACHINE, STRUCTURE OR SITUATION FOR APPLICATION OF MATERIALS. HAVE THE STUDENT MATCH THE TWO COLUMNS.

2. SHOW STUDENTS SLIDES OR PICTURES OF FARM MACHINERY, BUILDINGS AND OTHER STRUCTURES. HAVE EACH STUDENT PREPARE A LIST OF PROCEDURES TO FOLLOW IN PREPARING EACH ITEM FOR APPLICATION OF FINISHING AND PRESERVING MATERIALS.

3. A. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING SITUATIONS FOR APPLICATION OF FINISHING AND PRESERVING MATERIALS. HAVE EACH STUDENT SELECT THE METHOD OF APPLICATION.

   B. HAVE EACH STUDENT DEMONSTRATE SPRAY AND BRUSH APPLICATION OF FINISHING AND PRESERVING MATERIALS.

   C. HAVE EACH STUDENT DEMONSTRATE PROCEDURES TO FOLLOW IN CLEANING BRUSHES AND SPRAY EQUIPMENT.

4. A. FROM A LIST OF FINISHING AND PRESERVING MATERIALS, HAVE EACH STUDENT SELECT THE THINNING MATERIAL MOST SUITABLE FOR USE.

   B. HAVE EACH STUDENT DEMONSTRATE THE MIXING OF A FINISHING AND PRESERVING MATERIAL WITH A THINNING MATERIAL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF FINISHING AND PRESERVING MATERIALS
2. FINISHING AND PRESERVING MATERIALS CATALOGUES AND INFORMATION CHARTS, INCLUDING COLOR CHARTS
3. SAMPLES OF GREASE SOLVENTS
4. MASKING TAPE
5. SANDING EQUIPMENT, WIRE BRUSHES, STEEL WOOL
6. SPRAYING EQUIPMENT
7. BRUSHES
8. SPRAY PAINTING TRANSPARENCIES - 50 TRANSPARENCIES WITH MASTERS CONTAINING DESCRIPTIVE SCRIPT ("COURSE IN SPRAY PAINTING," THE DEVILBISS COMPANY, TOLEDO, OHIO)

F. EXAMPLES OF SUPPORTING REFERENCES

1. EXTERIOR PAINTING. G-155. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, SUPERINTENDENT OF DOCUMENTS. 1968.

   THIS REFERENCE GIVES INFORMATION ON SELECTION AND APPLICATION OF EXTERIOR PAINTS.

2. PAINT AND PAINTING. CIS-2. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, SUPERINTENDENT OF DOCUMENTS. 1971, 24 PAGES.

   INFORMATION IS PROVIDED REGARDING USES OF MANY DIFFERENT FINISHING AND PRESERVING MATERIALS.

3. SPRAY PAINTING. VAS 3-15. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1963, 28 PAGES.

   THIS REFERENCE GIVES DETAILED INFORMATION ON ALL PHASES OF SPRAY PAINTING. NUMEROUS ILLUSTRATIONS ARE INCLUDED.

PLANNING FARMSTEAD BUILDINGS

UNIT CONCEPT: PLANNING FOR NEEDED BUILDINGS ON THE FARMSTEAD WILL RESULT IN MORE EFFICIENT USE OF FINANCIAL RESOURCES AS WELL AS PROVIDE FUNCTIONAL FACILITIES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A DESCRIPTION OF A FARMSTEAD, TYPE OF OPERATION AND REFERENCES, DETERMINE THE TYPE AND KIND OF BUILDINGS NEEDED TO MEET THE NEEDS OF THE OPERATION WITHIN THE GIVEN AVAILABLE FINANCIAL RESOURCES.

2. WHEN GIVEN PLANS AND SKETCHES OF PLANNED FARMSTEAD BUILDINGS, FIGURE BILLS OF MATERIALS AND THE TOTAL COST OF THE BUILDINGS USING CURRENT MARKET PRICE INFORMATION.

B. INSTRUCTIONAL AREAS

1. ASSESSING THE BUILDING NEEDS OF THE FARMSTEAD

   A. IDENTIFYING TYPE OF FARMING OPERATION

      (1) CROP PRODUCTION
      (2) LIVESTOCK
      (3) POULTRY PRODUCTION
      (4) FORAGES

   B. DETERMINING LOCATION OF NEEDED BUILDINGS

   C. DETERMINING TYPES OF BUILDINGS NEEDED FOR THE SPECIFIC FARMING OPERATION

      (1) STORAGE
      (2) HOUSING
      (3) MATERIALS HANDLING

   D. ANALYZING EXISTING BUILDINGS FOR ADEQUACY AND POTENTIAL FOR REMODELING

   E. COMPARING COSTS OF CONSTRUCTION AND COSTS OF REMODELING EXISTING BUILDINGS

2. FIGURING BILLS OF MATERIALS

   A. IMPORTANCE OF FIGURING BILLS OF MATERIALS

   B. CALCULATING LUMBER COSTS

   C. CALCULATING COSTS OF WIRING AND OTHER ELECTRICAL INSTALLATIONS

   D. ESTIMATING COSTS OF NEEDED SUPPLIES, SUCH AS HARDWARE, NAILS

   E. CALCULATING COST OF NEEDED CONCRETE INSTALLATION

   F. FIGURING TOTAL COST OF BUILDING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS STUDY VARIOUS TYPES OF BUILDINGS, SUCH AS POLE, ALUMINUM, LUMBER, AND COMPARE USEFULNESS AND COST IN RELATION TO TYPE OF FARMING OPERATION.

   B. VISIT LUMBER YARDS, HARDWARE STORES AND OTHER PLACES HANDLING BUILDING MATERIALS TO DISCOVER THE KINDS OF MATERIALS AND EQUIPMENT AVAILABLE.

2. A. GIVE STUDENTS "EXAMPLE" BUILDINGS AND HAVE THEM ESTIMATE THE COST OF CONSTRUCTION OF THE BUILDINGS.

   B. HAVE A LOCAL CONTRACTOR VISIT THE CLASS AND DISCUSS THE PROCEDURES HE USES IN FIGURING BILLS OF MATERIALS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS LIST THE FACTORS TO CONSIDER WHEN DETERMINING TYPES AND KINDS OF BUILDINGS NEEDED FOR A FARMSTEAD. THIS LIST SHOULD INCLUDE THE FOLLOWING: (1) TYPE OF FARMING OPERATION; (2) USES TO BE MADE OF PRODUCTS PRODUCED; (3) COST OF CONSTRUCTION FOR VARIOUS BUILDING STYLES; AND (4) USEFULNESS OF AVAILABLE FACILITIES.

2. STUDENTS SHOULD BE ABLE TO FIGURE A BILL OF MATERIALS WITHIN 5% OF ACTUAL COST FOR AN "EXAMPLE" BUILDING. STUDENTS SHOULD BE PROVIDED WITH A LIST OF NEEDED MATERIALS AND CURRENT PRICE INFORMATION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PRICE INFORMATION CONCERNING VARIOUS TYPES OF BUILDING MATERIALS

2. PLANS OF VARIOUS FARM STRUCTURES

3. DRAWINGS OR SKETCHES OF BUILDINGS TYPICAL TO VARIOUS TYPES OF FARMING OPERATIONS

F. EXAMPLES OF SUPPORTING REFERENCES

1. PHIPPS, LLOYD J. MECHANICS IN AGRICULTURE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1967, PP. 155-158, 561-564.

   MATERIAL COVERED IN THESE SECTIONS INCLUDES FIGURING BILLS OF MATERIALS AND PLANNING NEEDED BUILDINGS FOR THE FARMSTEAD.

2. COMPANIES DEALING IN FARM BUILDINGS AND STRUCTURES HAVE PROMOTIONAL MATERIALS THAT CAN BE QUITE USEFUL WHEN STUDYING VARIOUS BUILDING TYPES FOR UTILITY AND COSTS.

USING CONSTRUCTION PLANS AND BLUEPRINTS

UNIT CONCEPT: ACCURATE INTERPRETATION OF THE INFORMATION GIVEN ON A CONSTRUCTION PLAN OR BLUEPRINT FOR A FARM BUILDING OR OTHER FARM STRUCTURE WILL ASSIST THE STUDENT IN DETERMINING CONSTRUCTION DETAILS, CALCULATING MATERIALS REQUIRED AND COSTS INVOLVED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH A CONSTRUCTION PLAN OR BLUEPRINT OF A BUILDING OR OTHER STRUCTURE, INTERPRET ALL MEASUREMENTS AND OTHER SYMBOLS USED IN DESCRIBING CONSTRUCTION DETAILS, INCLUDING THE DRAWING SCALE USED, TO THE EXTENT THAT THE AMOUNT OF MATERIAL REQUIRED AND CONSTRUCTION PROCEDURES CAN BE DETERMINED WITH ACCURACY ACCORDING TO SPECIFICATIONS OF DRAFTING AND CONSTRUCTION PERSONNEL AND THE INSTRUCTOR.

2. WHEN PROVIDED WITH A CONSTRUCTION PLAN OR BLUEPRINT OF A FARM BUILDING, CALCULATE THE AREAS, IN SQUARE FEET, OF THE FLOOR, WALLS, ROOF, WINDOWS, DOORS; THE CUBIC FOOT AREA OF THE FOOTING, FOUNDATION, FLOOR AND BUILDING INTERIOR WITH THE ACCURACY ACCORDING TO RECOMMENDATIONS OF CONSTRUCTION PERSONNEL AND THE INSTRUCTOR.

3. WHEN PROVIDED WITH A CONSTRUCTION PLAN OR BLUEPRINT OF A FARM BUILDING, DETERMINE THE ROOF PITCH AND TYPE OF RAFTER CONSTRUCTION TO USE, INCLUDING LAYOUT AND CUTTING DETAILS, WITH ACCURACY ACCORDING TO RECOMMENDATIONS OF CONTRUCTION PERSONNEL AND THE INSTRUCTOR.

4. WHEN PROVIDED WITH A CONSTRUCTION PLAN OR BLUEPRINT OF A FARM BUILDING OR OTHER STRUCTURE, INTERPRET THE MEASUREMENT INFORMATION GIVEN ON THE PLAN OR BLUEPRINT TO THE EXTENT THAT ALL MATERIALS WILL BE CUT TO THE CORRECT LENGTH, WIDTH AND ANGLE WITH THE ACCURACY REQUIRED BY THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. INTERPRETING MEASUREMENTS AND OTHER SYMBOLS OF PLANS AND BLUEPRINTS

A. DETERMINING HOW FIGURES ARE USED IN DESCRIBING BUILDING AND OTHER STRUCTURAL MEASUREMENTS

B. DETERMINING HOW DRAWING SCALES ARE CALCULATED AND USED

C. CONVERTING SCALE MEASUREMENTS TO ACTUAL LENGTH, WIDTH AND THICKNESS MEASUREMENTS

2. CALCULATING SQUARE AND CUBIC FEET

A. CALCULATING SQUARE AND CUBIC FOOT REQUIREMENTS FOR FLOOR, ROOF, WINDOWS AND DOORS

B. CALCULATING CUBIC FOOT REQUIREMENTS FOR FOOTING, FOUNDATION AND FLOORS

C. CALCULATING LUMBER BILLS OF MATERIALS

(1) WRITING BILLS OF MATERIALS
(2) CALCULATING BOARD FEET
(3) CALCULATING COSTS

D. CALCULATING SQUARE FOOT REQUIREMENTS FOR ROOFING MATERIALS

E. CALCULATING CUBIC FOOT REQUIREMENTS OF MASONRY MATERIALS FOR FOOTING, FOUNDATION AND FLOOR

3. DETERMINING RAFTER CONSTRUCTION DETAILS

A. CALCULATING RAFTER LENGTHS FROM GIVEN PITCHES

B. DETERMINING CONSTRUCTION DETAILS OF TRUSS RAFTER CONSTRUCTION

4. CALCULATING MATERIAL LENGTHS, WIDTHS AND ANGLES

A. DETERMINING LENGTH AND WIDTH MEASURING PROCEDURES

B. USING STEEL SQUARE, PROTRACTOR AND T-BEVEL IN DETERMINING ANGLE CUTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS EXAMINE CONSTRUCTION PLANS FOR BUILDINGS AND OTHER STRUCTURES AND MAKE A LIST OF SYMBOLS USED AND DESCRIBE THE MEANING OF EACH.

B. HAVE STUDENTS EXAMINE CONSTRUCTION PLANS FOR BUILDINGS AND OTHER STRUCTURES AND, FROM MEASUREMENTS GIVEN, WRITE OUT MATERIALS NEEDED IN LENGTH, WIDTH AND THICKNESS, CUBIC FOOT REQUIREMENTS FOR MASONRY MATERIALS AND SQUARE FOOT REQUIREMENTS FOR ROOFING AND SHEETING MATERIALS.

C. HAVE STUDENTS EXAMINE CONSTRUCTION PLANS FOR BUILDINGS AND OTHER STRUCTURES AND HAVE THEM PREPARE A LIST OF PROCEDURES TO USE IN CONSTRUCTION OF THE BUILDING OR OTHER STRUCTURE.

2. HAVE STUDENTS EXAMINE CONSTRUCTION PLANS OF FARM BUILDINGS AND PREPARE A LIST OF DIMENSIONS FOR THE DOORS AND WINDOWS.

3. HAVE STUDENTS EXAMINE THE ROOF DIMENSIONS AND OTHER CONSTRUCTION DETAILS, AS DESCRIBED ON A PLAN, AND HAVE THEM DETERMINE LENGTHS, ANGLE CUTS AND BRACING DIMENSIONS.

4. HAVE STUDENTS EXAMINE PLANS OF STRUCTURES INVOLVING SIMPLE AND COMPOUND ANGLES; HAVE THEM PRACTICE LAYING OUT THE ANGLES FROM THE MEASUREMENTS GIVEN ON THE PLANS USING A STEEL SQUARE OR PROTRACTOR.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. DEVELOP A MATCHING TEST; ONE COLUMN BEING A LIST OF NAMES OR SYMBOLS DESCRIBING CONSTRUCTION DETAILS FOR A BUILDING OR OTHER STRUCTURE; THE SECOND COLUMN, DESCRIPTIONS OF EACH. HAVE STUDENTS ARRANGE FOR CORRECTNESS.

B. PROVIDE EACH STUDENT WITH A CONSTRUCTION PLAN OF A BUILDING OR OTHER STRUCTURE. HAVE THEM CALCULATE THE MATERIAL REQUIREMENTS FOR PART OR ALL OF THE BUILDING OR STRUCTURE WITH 90% ACCURACY.

C. PROVIDE STUDENTS WITH A CONSTRUCTION PLAN OR BLUEPRINT OF A BUILDING AND A LIST OF CONSTRUCTION PROCEDURES THAT ARE NOT IN PROPER ORDER; HAVE THEM ARRANGE THE PROCEDURES IN THE PROPER ORDER WITH COMPLETE ACCURACY.

2. PROVIDE STUDENTS WITH THE CONSTRUCTION PLANS OF BUILDING AND SPECIFIC INFORMATION REGARDING REQUIREMENTS FOR LIVESTOCK OR OTHER USE. HAVE THEM SPECIFY IF THE BUILDING IS ADEQUATE.

3. PROVIDE STUDENTS WITH CONSTRUCTION PLANS OF THE ROOF FOR A BUILDING. HAVE THEM DETERMINE ROOF PITCH AND ANGLE CUTS OF RAFTERS AND TRUSS BRACING WITH 90% ACCURACY.

4. PROVIDE STUDENTS WITH PLANS OF A STRUCTURE INVOLVING COMPOUND ANGLES. HAVE THEM DIAGRAM HOW THE ANGLES WOULD BE

LAID OUT USING A STEEL SQUARE OR PROTRACTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CONSTRUCTION PLANS OF FARM BUILDINGS AND OTHER STRUCTURES
2. SLIDES AND PICTURES OF CONSTRUCTION PLANS
3. STEEL SQUARES AND PROTRACTORS
4. ARCHITECT SCALES
5. GRAPH PAPER
6. LUMBER FOR PRACTICE MEASUREMENTS AND LAYING OUT ANGLES

F. EXAMPLES OF SUPPORTING REFERENCES

1. FOUNDATIONS FOR FARM BUILDINGS. F 1869. WASHINGTON: D.C.: U.S. DEPARTMENT OF AGRICULTURE, SUPERINTENDENT OF DOCUMENTS. 1969, 28 PAGES.

   MATERIAL COVERED INCLUDES LAYING OUT AND CONSTRUCTING FOUNDATIONS FOR BUILDINGS.

2. ROOFING FARM BUILDINGS. F 2170. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, SUPERINTENDENT OF DOCUMENTS. 1969, 28 PAGES.

   THIS REFERENCE PROVIDES GENERAL INFORMATION ABOUT ROOFING TECHNIQUES AND PROCESSES.

3. SELECTING LUMBER AND OTHER BUILDING MATERIALS. VAS 3006. URBANA, ILLINOIS: VOCATIONAL AGRICULTURAL SERVICE, UNIVERSITY OF ILLINOIS. 1957, 12 PAGES.

   ONE SECTION OF THIS REFERENCE (PAGES 9 AND 10) PROVIDES INFORMATION ON FIGURING BILLS OF MATERIALS.

4. USE OF THE SQUARE IN FARM CONSTRUCTION. VAS 3009. URBANA, ILLINOIS: VOCATIONAL AGRICULTURAL SERVICE, UNIVERSITY OF ILLINOIS. 1959, 20 PAGES.

   THIS REFERENCE PROVIDES INFORMATION IN USING THE SQUARE IN DETERMINING RAFTER ANGLE CUTS AND OTHER STRUCTURES INVOLVING CUTTING MATERIALS ON AN ANGLE.

SELECTION OF LUMBER, HARDWARE AND OTHER BUILDING MATERIALS

UNIT CONCEPT: USING LUMBER, HARDWARE OR OTHER BUILDING MATERIALS FOR FARM CONSTRUCTION PURPOSES REQUIRES CAREFUL SELECTION PROCEDURES. MANY GRADES AND KINDS OF MATERIALS ARE AVAILABLE FROM WHICH TO CHOOSE. MATERIALS SHOULD BE SELECTED ACCORDING TO THE SPECIFIC REQUIREMENTS FOR EACH CONSTRUCTION JOB, COMPARATIVE COSTS OF MATERIALS AND THE LABOR INVOLVED IN USING THE MATERIALS, IN ORDER TO PROVIDE ECONOMY AND EFFICIENCY IN THE BUILDING CONSTRUCTION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH THE PROBLEM OF SELECTING LUMBER FOR CONSTRUCTION OF A BUILDING OR OTHER STRUCTURE, SELECT THE KIND AND GRADE MOST SUITED FOR THE INTENDED USE, AT THE LOWEST COST, AND ACCORDING TO SPECIFICATIONS OF THE BUILDING PLAN OR BLUEPRINT.

2. WHEN PRESENTED WITH THE PROBLEM OF SELECTING ROOFING MATERIAL FOR A BUILDING, SELECT THE MATERIAL MOST SUITABLE FOR USE BASED ON COMPARATIVE COSTS, EASE OF APPLICATION, AND SERVICEABILITY, AND COMPLYING WITH RECOMMENDATIONS OF BUILDING CONSTRUCTION SPECIALISTS AND ROOF MATERIAL MANUFACTURERS.

3. WHEN PRESENTED WITH THE PROBLEM OF SELECTING DOORS, WINDOWS AND VENTILATORS FOR A BUILDING, SELECT THE MATERIALS MOST SUITABLE FOR THE INTENDED USE OF THE BUILDING, ACCORDING TO COSTS, EASE OF INSTALLATION, AND COMPLYING WITH RECOMMENDATIONS OF CONSTRUCTION AND MATERIALS SUPPLY SPECIALISTS.

4. WHEN GIVEN THE PROBLEM OF INSULATING A BUILDING, EITHER NEW, ONE UNDER CONSTRUCTION, OR AN EXISTING ONE, SELECT THE KIND OF INSULATION PROVIDING THE MOST PROTECTION FROM HEAT AND COLD, AT THE LEAST COST, AND ACCORDING TO SPECIFICATIONS OF BUILDING SPECIALISTS.

5. WHEN GIVEN THE PROBLEM OF SELECTING MATERIALS FOR USE ON WALLS AND CEILINGS OF THE INTERIOR OF A BUILDING, SELECT THOSE MATERIALS PROVIDING THE MOST SERVICEABILITY, AT THE LEAST COST, COMPLYING WITH BUILDING PLAN SPECIFICATIONS AND RECOMMENDATIONS OF CONSTRUCTION AND MATERIAL SPECIALISTS.

6. WHEN PRESENTED WITH THE PROBLEM OF SELECTING THE HARDWARE TO USE IN THE CONSTRUCTION OF A BUILDING OR OTHER STRUCTURE, DETERMINE THE KINDS AND AMOUNTS OF THE DIFFERENT ITEMS NEEDED, AND SELECT THE ITEMS BASED ON COMPARATIVE COSTS, SERVICEABILITY, AND ACCORDING TO SPECIFICATIONS PROVIDED BY THE PLAN OR BLUEPRINT, AND THE RECOMMENDATIONS OF CONSTRUCTION SPECIALISTS.

B. INSTRUCTIONAL AREAS

1. SELECTING LUMBER FOR BUILDING CONSTRUCTION

    A. SELECTING FRAMING MATERIALS

        (1) STUDDING
        (2) SUPPORT BEAMS
        (3) JOISTS
        (4) RAFTERS
        (5) BRACES

    B. COMPARING COSTS OF DRESSED AND ROUGH SAWED LUMBER

    C. COMPARING COSTS OF DIFFERENT GRADES

    D. COMPARING SUPPORT STRENGTH OF DIFFERENT MATERIALS

    E. DETERMINING EASE OF APPLICATION

2. SELECTING LUMBER FOR SHEATHING AND SIDING

    A. COMPARING COSTS AND QUALITY OF PLYWOOD SHEATHING MATERIALS

    B. DETERMINING TYPE OF BOARD PATTERN FOR SIDING MATERIALS

        (1) COMPARING COSTS
        (2) DETERMINING EASE OF APPLICATION

3. SELECTING LUMBER ITEMS FOR FINISHING WORK

    A. DETERMINING KINDS AND TYPES OF MOULDING MATERIALS AVAILABLE AND USE APPLICATIONS

    B. COMPARING COSTS OF MOULDING MATERIALS

    C. COMPARING INSTALLATION PROBLEMS WITH MOULDING MATERIALS

    D. SELECTING DOOR AND WINDOR FRAMES

4. SELECTING LUMBER FOR STRUCTURES OTHER THAN BUILDINGS

    A. DETERMINING THE KIND OF SERVICE UNDER WHICH STRUCTURE WILL BE USED

    B. COMPARING SERVICEABILITY OF KINDS AND GRADES OF LUMBER FOR STRUCTURAL USE

    C. COMPARING COSTS OF MATERIALS

5. SELECTING ROOFING MATERIALS FOR A BUILDING

    A. DETERMINING KINDS OF ROOFING MATERIALS RECOMMENDED FOR DIFFERENT ROOF TYPES

    B. COMPARING COSTS OF ROOFING MATERIALS

    C. COMPARING SERVICEABILITY, EASE OF APPLICATION AND RESISTANCE TO FIRE HAZARDS

6. SELECTING DOORS FOR BUILDING CONSTRUCTION

    A. DETERMINING KINDS AND TYPES OF DOORS AND THEIR SPECIFIC USES

        (1) PASSAGE DOORS
        (2) OVERHEAD DOORS
        (3) STORM DOORS
        (4) TRAP DOORS
        (5) HOLLOW CASE
        (6) PANELLED

    B. COMPARING COSTS

    C. COMPARING SERVICEABILITY AND EASE OF INSTALLATION

7. SELECTING WINDOWS FOR BUILDING CONSTRUCTION

    A. DETERMINING KINDS AND TYPES OF WINDOWS AND THEIR SPECIFIC USES

        (1) DOUBLE SASH
        (2) SINGLE SASH
        (3) SINGLE PANE
        (4) MULTIPLE PANE
        (5) AWNING
        (6) CASEMENT

    B. COMPARING COSTS

    C. COMPARING SERVICEABILITY AND EASE OF INSTALLATION

8. SELECTING VENTILATORS

   A. DETERMINING TYPES AND THEIR USES

      (1) EAVE
      (2) WALL
      (3) GABLE
      (4) ROOF

   B. COMPARING COSTS, SERVICEABILITY AND EASE OF INSTALLATION

9. SELECTING INSULATION MATERIALS

   A. DETERMINING INSULATING QUALITIES OF MATERIALS

   B. DETERMINING EASE OF INSTALLING MATERIALS

   C. COMPARING COSTS

10. SELECTING INTERIOR WALLS AND CEILING COVERING MATERIALS

   A. DETERMINING KINDS AND TYPES OF MATERIALS TO USE

      (1) WOOD PANELS
      (2) DRY WALL (PLASTER BOARD)
      (3) MASONITE PRODUCTS
      (4) PLYWOOD
      (5) PLASTER
      (6) TILE

   B. COMPARING COSTS

   C. COMPARING SERVICEABILITY AND EASE OF INSTALLING

11. SELECTING HARDWARE ITEMS FOR CONSTRUCTION USE

   A. SELECTING NAILS

      (1) DETERMINING SIZE REQUIRED
      (2) SELECTING KIND AND TYPE TO USE

         (A) COMMON
         (B) BOX
         (C) SCREW SHANK
         (D) RING SHANK
         (E) RUSTPROOF
         (F) FINISHING
         (G) CASING
         (H) ROOFING

      (3) CALCULATING AMOUNT REQUIRED

B. SELECTING WOOD SCREWS

  (1) DETERMINING SIZE REQUIRED BY SCREW NUMBER
  (2) SELECTING KIND AND TYPE TO USE

    (A) FLAT HEAD
    (B) ROUND HEAD
    (C) OVAL HEAD
    (D) RUSTPROOF
    (E) LAY SCREWS

C. SELECTING BOLTS

  (1) DETERMINING SIZE REQUIRED
  (2) SELECTING TYPE TO USE

    (A) CARRIAGE HEAD
    (B) MACHINE HEAD
    (C) STONE
    (D) MACHINE SCREW TYPE

D. SELECTING HINGES

  (1) SELECTING SIZE TO USE
  (2) SELECTING KIND AND TYPE TO USE

    (A) STRAP
    (B) BUTT
    (C) LOOSE PIN
    (D) T
    (E) GATE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS VISIT A LUMBER DEALER'S PLACE OF BUSINESS, DETERMINING THE KINDS AND GRADES OF LUMBER AND LUMBER PRODUCTS AVAILABLE AND THE COST OF EACH ITEM.

B. HAVE STUDENTS PREPARE LUMBER INFORMATION SHEETS BY LISTING THE PRODUCTS FOR SALE, MAIN USES, UNIT BY WHICH THEY ARE SOLD (BOARD FEET, SQUARE FEET, LINEAL FEET) AND COST PER UNIT.

C. HAVE STUDENTS MAKE PRICE COMPARISON TABLES FROM DIFFERENT LUMBER SUPPLIERS.

2. HAVE A ROOFING SPECIALIST DISCUSS WITH THE CLASS THE KINDS OF ROOFING MATERIALS FOR USE, SUGGESTED USE CONDITIONS, EASE OF APPLICATION AND COSTS. HAVE EACH STUDENT MAKE A RECORD OF THE INFORMATION PROVIDED.

3. USING CATALOGUES DESCRIBING DOORS, WINDOWS AND VENTILATORS, HAVE STUDENTS PREPARE AN INFORMATION SHEET ON KINDS, TYPES, COSTS, SERVICEABILITY AND INSTALLATION PROCEDURES.

4. PROVIDE STUDENTS WITH SAMPLES OF THE DIFFERENT KINDS OF INSULATION MATERIALS WITH INFORMATION REGARDING INSULATION QUALITIES, COSTS AND INSTALLATION METHODS. HAVE EACH STUDENT PREPARE AN INFORMATION SHEET.

5. COMPARE COSTS OF VARIOUS MATERIALS USED FOR INTERIOR WALLS AND CEILINGS AND HAVE STUDENTS MAKE A CHART WHICH DETAILS THIS INFORMATION.

6. PROVIDE STUDENTS WITH SAMPLES OF THE COMMON HARDWARE ITEMS FOR EXAMINATION. HAVE EACH STUDENT LIST THE CORRECT NAMES OF EACH ITEM, USES, AND SIZING CATEGORY (NUMBER AND GAUGE).

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PROVIDE EACH STUDENT WITH A PLAN OR BLUEPRINT FOR A BUILDING OR OTHER STRUCTURE; HAVE THEM PREPARE A LIST OF THE KIND, GRADE, TYPE AND SIZE OF LUMBER TO USE FOR CONSTRUCTION.

   B. USING SPECIFIC INFORMATION REGARDING THE GRADES OF THE SAME KIND OR TYPE OF LUMBER AND COSTS OF EACH, HAVE EACH STUDENT MAKE COMPARISON COSTS.

2. PROVIDE STUDENTS WITH SEVERAL ROOF SELECTION PROBLEMS, AND INFORMATION REGARDING ROOFING MATERIALS; HAVE EACH STUDENT SELECT THE MATERIALS TO USE FOR EACH SITUATION.

3. FROM THE INFORMATION SUPPLIED BY A PLAN OR BLUEPRINT OF A BUILDING, WHICH GIVES LOCATION AND SIZE OF DOORS, WINDOWS AND VENTILATORS, HAVE EACH STUDENT SELECT THE KIND AND TYPE OF DOORS, WINDOWS AND VENTILATORS TO USE.

4. PROVIDE STUDENTS WITH TWO OR THREE INSULATION PROBLEMS; HAVE THEM SELECT THE MATERIALS MOST SUITABLE FOR THE SITUATION.

5. HAVE STUDENTS LIST THE CRITICAL FACTORS TO CONSIDER IN SELECTING MATERIALS FOR USE ON INTERIOR WALLS AND CEILINGS OF A BUILDING.

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6. A. HAVE STUDENTS SPECIFICALLY IDENTIFY HARDWARE ITEMS BY VIEWING THE ITEM OR A PICTURE OF THE ITEM.

   B. HAVE STUDENTS, AFTER EXAMINING A PLAN OR BLUEPRINT OF A STRUCTURE, SELECT THE HARDWARE ITEMS NEEDED, INCLUDING THE AMOUNTS OF EACH REQUIRED FOR ASSEMBLING THE STRUCTURE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SAMPLES OF LUMBER GRADES, KINDS AND SIZES
2. SAMPLES OF LUMBER PRODUCTS - GRADES, KINDS AND SIZES
3. SAMPLES OF ROOFING MATERIALS
4. SAMPLES OF INSULATION MATERIALS
5. CATALOGUES OF HARDWARE, DOORS, WINDOWS AND VENTILATORS
6. SAMPLES OF COMMON HARDWARE ITEMS
7. BUILDING AND OTHER STRUCTURE PLANS AND BLUEPRINTS.

F. EXAMPLES OF SUPPORTING REFERENCES

1. JONES. SHOP WORK ON THE FARM. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1970, 626 PAGES.

   GIVES DETAILED INFORMATION ON MOST PHASES OF AGRICULTURAL MECHANICS.

2. SELECTING LUMBER AND OTHER BUILDING MATERIALS. VAS 3006. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1957, 10 PAGES.

   THIS REFERENCE GIVES INFORMATION ON GRADES, KINDS AND SIZES OF LUMBER. IT ALSO HAS INFORMATION ON NAIL SIZES AND NUMBER OF NAILS PER POUND BY SIZE OF NAIL.

3. SELECTION AND USE OF WOOD PRODUCTS FOR HOME AND FARM BUILDING. AI 311. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, SUPERINTENDENT OF DOCUMENTS. 1972, 44 PAGES.

   GIVES A GENERAL OVERVIEW OF THE FACTORS TO CONSIDER WHEN SELECTING AND USING WOOD FOR CONSTRUCTION.

PREPARING BUILDING SITES AND FOUNDATIONS

UNIT CONCEPT: BUILDING SITES AND FOUNDATIONS MUST BE PREPARED ACCORDING TO RECOGNIZED PROCEDURES IN ORDER THAT LATER CONSTRUCTION ACTIVITIES CAN BE CONDUCTED EFFICIENTLY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A PROPOSED BUILDING SITE AND PLANS FOR CONSTRUCTION, PREPARE THE SITE BY GRADING AND LEVELING SUCH THAT THE SITE IS READY FOR WORK TO BEGIN ON THE FOUNDATION OR FOOTERS.
2. WHEN GIVEN A GRADED AND LEVELED BUILDING SITE AND BUILDING PLANS, LAY OUT THE FOUNDATION BY THE THREE, FOUR, FIVE TRIANGLE METHOD TO THE SATISFACTION OF THE TEACHER.
3. WHEN GIVEN A FOUNDATION SITE, CONSTRUCT A FOUNDATION ACCORDING TO RECOMMENDED PROCEDURES AND TO THE SATISFACTION OF THE TEACHER.

B. INSTRUCTIONAL AREAS

1. PREPARING BUILDING SITES
    - A. STUDYING BUILDING PLANS FOR LOCATION AND SIZE OF BUILDING
    - B. DETERMINING AMOUNT OF GRADING NEEDED FOR THE SITE
    - C. CONTACTING CONTRACTORS IF EXTENSIVE GRADING OPERATIONS ARE NEEDED
    - D. PERFORMING SIMPLE GRADING OPERATIONS
2. LAYING OUT FOUNDATIONS
    - A. LOCATING THE CORNERS
    - B. USING A SURVEYOR'S LEVEL
    - C. SQUARING CORNERS AND ERECTING BATTER BOARDS

3. CONSTRUCTING FOUNDATIONS
    - A. DIGGING OUT FOOTER SITE
    - B. SELECTING MATERIALS FOR CONSTRUCTING FOOTERS
        - (1) CONCRETE
        - (2) LUMBER FOR FORMS
        - (3) CONCRETE BLOCKS
    - C. MIXING CONCRETE FOR FOOTERS AND FOUNDATIONS
    - D. PLACING AND FINISHING CONCRETE IN FORMS FOR FOOTERS
    - E. PROCEDURE FOR LAYING BLOCKS FOR FOUNDATIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. GIVE STUDENTS PICTURES OR DRAWING OF BUILDING SITES AND HAVE THEM DETERMINE THE GRADING NECESSARY TO PREPARE THE SITE FOR BUILDING.

2. STUDENTS SHOULD PRACTICE LAYING OUT FOUNDATIONS BY THE THREE, FOUR, FIVE TRIANGLE METHOD.

3. A. HAVE STUDENTS PREPARE A SITE FOR LAYING A FOOTER.
    - B. HAVE STUDENTS PRACTICE LAYING CONCRETE BLOCKS

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. FROM PICTURES OR DESCRIPTIONS OF PROPOSED BUILDING SITES, STUDENTS SHOULD DETERMINE WHETHER PROFESSIONAL GRADING IS NECESSARY AND IF SO, THE ESTIMATED COST OF SUCH GRADING TO THE SATISFACTION OF THE INSTRUCTOR.

2. HAVE EACH STUDENT EXPLAIN OR DEMONSTRATE THE PROCEDURE FOR LAYING OUT A FOUNDATION BY THE THREE, FOUR, FIVE TRIANGLE METHOD WITH 95% ACCURACY.

3. HAVE EACH STUDENT DEMONSTRATE THE PROCEDURES INVOLVED IN CONSTRUCTING A BUILDING FOUNDATION WHICH IS LEVEL, DURABLE AND OF SUFFICIENT SIZE AND STRENGTH FOR THE PLANNED BUILDING.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. LUMBER FOR BUILDING FORMS

2. CHALK LINE AND LEVELS

3. MASONRY TOOLS
4. CONCRETE BLOCKS AND CEMENT
5. CEMENT MIXER

F. EXAMPLES OF SUPPORTING REFERENCES

1. PHIPPS. LLOYD J. MECHANICS IN AGRICULTURE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS. 1967, PP. 561-581.

   THIS TEXT COVERS THE GENERAL CONSIDERATIONS OF LAYING OUT FOUNDATIONS, INCLUDING USING THE THREE, FOUR, FIVE TRIANGLE METHOD.

2. TOENNIES, HENRY. CONCRETE MASONRY. ARLINGTON, VIRGINIA: NATIONAL CONCRETE MASONRY ASSOCIATION. 1973, 74 PAGES.

   A COMPREHENSIVE THREE-PART SERIES INCLUDING AN INSTRUCTOR'S GUIDE, STUDENT MANUAL, AND STUDENT STUDY GUIDE WHICH GIVES COMPREHENSIVE CONSIDERATION TO ALL ASPECTS OF CONCRETE MASONRY.

BUILDING CONSTRUCTION TECHNIQUES AND PROCESSES

UNIT CONCEPT: BUILDINGS CONSTRUCTED ACCORDING TO RECOMMENDED PROCEDURES AND TECHNIQUES WILL BE DURABLE, LONG-LASTING AND SERVE THE FUNCTION FOR WHICH THEY WERE DESIGNED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A BUILDING NEEDING FLOORING, AND SUFFICIENT MATERIALS, ASSIST IN LAYING SUB-FLOORING ACCORDING TO RECOMMENDED PROCEDURES TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN GIVEN A BLUEPRINT OF A PROPOSED STRUCTURE, ASSIST IN CUTTING AND PLACING WALL, CEILING AND ROOF MATERIALS ACCORDING TO THE SPECIFICATIONS OF THE BLUEPRINT AND TO THE SATISFACTION OF THE INSTRUCTOR.

3. WHEN GIVEN A BUILDING WITH A ROOF IN NEED OF CONSTRUCTION OR REPAIR, ASSIST IN LAYING ROOFING MATERIAL ACCORDING TO RECOMMENDED PROCEDURES.

4. WHEN GIVEN A FRAMED BUILDING AND SUFFICIENT MATERIALS, ASSIST IN CONSTRUCTING EXTERIOR WALLS ACCORDING TO BLUEPRINT SPECIFICATIONS AND TO THE SATISFACTION OF THE INSTRUCTOR.

5. WHEN GIVEN A FRAMED AND ROOFED BUILDING, ASSIST IN INSTALLING WINDOWS AND HANGING DOORS ACCORDING TO RECOMMENDED PROCEDURES AND TO THE SATISFACTION OF THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. FLOOR FRAMING AND SUB-FLOORS

   A. USING GIRDERS AND COLUMNS

   B. IDENTIFYING TYPES OF FRAMING

      (1) BALOON
      (2) PLATFORM
      (3) BRACED

C. DETERMINING TYPES OF FOUNDATION SILLS USED IN BUILDING CONSTRUCTION

D. CONSTRUCTING SILLS ACCORDING TO BLUEPRINT SPECIFICATIONS

E. LEVELING AND ANCHORING SILLS

F. INSTALLING TERMITE SHIELDS

G. CUTTING AND PLACING FLOOR JOISTS

(1) DETERMINING SAFE SPAN LENGTHS FOR HIGHEST QUALITY WOOD JOISTS
(2) LAYING OUT JOISTS

(A) DOUBLE JOIST SPACING FOR INSTALLATION OF HEATING AND PLUMBING
(B) HEADER JOIST LAYOUT
(C) PARTITION SUPPORT

(3) INSTALLING JOISTS ACCORDING TO BLUEPRINT

H. IDENTIFYING MATERIALS TO USE FOR SUB-FLOORING

I. LAYING SUB-FLOORS

2. FRAMING WALLS AND CEILINGS

A. IDENTIFYING PARTS OF THE WALL AND CEILING FRAMES

B. DETERMINING PLATE LAYOUT FOR FRAMING MATERIALS

C. DETERMINING MASTER STUD LAYOUT

D. CONSTRUCTING WALL SECTIONS

(1) NAILING PATTERN FOR WALL ASSEMBLY
(2) TOENAILING STUDS
(3) BRACING WALL FRAMING

E. ERECTING WALL SECTIONS

(1) CUTTING AND PLACING TEMPORARY BRACES
(2) LEVELING AND STRAIGHTENING WALL
(3) INSTALLING THE DOUBLE TOP PLATE
(4) BRACING FOR ADDED WALL RIGIDITY

F. CONSTRUCTING AND INSTALLING CEILING FRAMING

(1) DETERMINING SPAN FOR NORMAL DEAD AND LIVE LOAD FOR CEILING JOIST

- (2) LAYING OUT THE TRIM CUT AND END OF CEILING JOIST
- (3) PLACING THE STUB CEILING JOIST ALONG THE END WALL
- (4) ANCHORING PARTITIONS TO CEILING FRAME WHEN THEY RUN PARALLEL TO THE JOIST

3. ROOF FRAMING

A. IDENTIFYING ROOF TYPES AND STYLES

B. IDENTIFYING PARTS OF ROOF FRAME

C. LAYING OUT COMMON RAFTERS TO BLUEPRINT SPECIFICATIONS

- (1) USING THE RAFTER TABLE ON THE FRAMING SQUARE
- (2) LAYING OUT RAFTERS BY THE STEP-OFF METHOD

D. ERECTING A GABLE ROOF

- (1) CONSTRUCTING THE GABLE END FRAME
- (2) FRAMING THE STUDS FOR A GABLE END
- (3) FRAMING FOR ENTENDED ROOF RAKE AT GABLE END
- (4) ALLOWING FOR VENT OPENINGS

E. CUTTING AND PLACING HIP AND VALLEY RAFTERS

- (1) STEPS TO FOLLOW IN FRAMING HIP OR VALLEY RAFTERS
- (2) USING THE FRAMING SQUARE TO LAY OUT SIDE CUTS ON HIP AND VALLEY RAFTERS
- (3) DETERMINING DISTANCE TO DROP A HIP RAFTER

F. CUTTING AND ERECTING JACK RAFTERS

- (1) USING THE FRAMING SQUARE TO DETERMINE THE COMMON DIFFERENCE OF JACK RAFTERS
- (2) USING THE FRAMING SQUARE TO LAY OUT SIDE CUT

G. INSTALLING ROOF TRUSSES

H. SHEATHING FRAMED ROOFS

4. ROOFING FARM BUILDINGS

A. IDENTIFYING TYPES OF ROOFING MATERIALS

B. PREPARING THE ROOF DECK

C. APPLYING ASPHALT ROOFING

D. INSTALLING FLASHINGS AROUND VENTS, HIPS AND RIDGES

- E. APPLYING MINERAL FIBER SHINGLES AND FLASHINGS
- F. APPLYING METAL ROOFING
    - (1) GALVANIZED SHEET METAL
    - (2) ALUMINUM ROOFING
    - (3) TERNE METAL ROOFING
- G. INSTALLING GUTTERS

5. CONSTRUCTING EXTERIOR WALLS
    - A. IDENTIFYING TYPES OF WALL SHEATING
    - B. PLACING SHEATHING AND NAILING
    - C. USING BUILDING PAPER
    - D. IDENTIFYING TYPES OF BOARD SIDING
    - E. NAILING AND ARRANGEMENT OF JOINTS
    - F. USING OTHER TYPES OF SIDING (SHINGLES, ASBESTOS)
    - G. USING CORNER BOARDS
    - H. USING BRICKS AND CEMENT BLOCKS
6. INSTALLING WINDOWS AND DOORS
    - A. IDENTIFYING TYPES OF WINDOWS AND SIZES
    - B. INSTALLING WINDOW FRAMES ACCORDING TO BLUEPRINT SPECIFICATIONS
    - C. INSTALLING WINDOWS
    - D. HANGING DOORS
        - (1) FITTING A DOOR
        - (2) ATTACHING HINGES
        - (3) PROVIDING CORRECT CLEARANCE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS MAKE SKETCHES OF THE STEPS INVOLVED IN FLOOR FRAMING.

   B. VISIT BUILDINGS UNDER CONSTRUCTION AND HAVE STUDENTS OBSERVE DIFFERENT TYPES OF FLOOR FRAMINGS AND METHODS OF SUB-FLOORING.

2. A. SECURE A SET OF HOUSE PLANS FOR A SINGLE STORY BUILDING AND STUDY THE DETAILS OF CONSTRUCTION OF THE WALLS AND CEILINGS.

   B. VISIT A BUILDING SUPPLY STORE AND STUDY THE TYPES OF SHEATHING, GYPSUM BOARD AND FIBER BOARD. SECURE DESCRIPTIVE LITERATURE FROM LOCAL DEALERS AND COMPANIES.

   C. HAVE STUDENTS PRACTICE CUTTING RAFTERS AND BRACES USING THE RAFTER TABLE OR A FRAMING SQUARE.

3. A. HAVE STUDENTS SECURE DESCRIPTIVE LITERATURE FROM BUSINESSES OR MANUFACTURERS DESCRIBING KIND, GRADES AND COSTS OF ROOFING AND OTHER ROOFING MATERIALS AND THEN MAKE A CHART WHICH COMPARES THE VARIOUS ROOFING MATERIAL TYPES.

   B. HAVE STUDENTS MAKE A SMALL ROOF MODEL AND SHOW THE STEPS IN APPLYING AN ASPHALT ROOF.

4. VISIT A LUMBER YARD OR BUILDING SUPPLY STORE AND STUDY DIFFERENT TYPES OF SIDING. STUDENTS MAY TAKE NOTES OR GET DESCRIPTIVE LITERATURE ON VARIOUS TYPES OF SIDING. HAVE THEM COMPARE MATERIALS AVAILABLE BY MAKING A WALL CHART WHICH DESCRIBES COSTS, DURABILITY, SIZES, AND OTHER DESCRIPTIVE INFORMATION.

5. A. USE A SET OF HOUSE PLANS THAT DO NOT HAVE A WINDOW SCHEDULE. VISIT A LOCAL WINDOW SUPPLY STORE AND GET WINDOW INFORMATION ON WINDOW TYPES, SIZES, SPECIFICATIONS AND PRICES. HAVE STUDENTS PREPARE A COMPLETE WINDOW SCHEDULE FOR THE HOUSE PLANS, INDICATING ROUGH OPENINGS AND DATA SHEET FOR CARPENTERS USE AND ESTIMATED COST.

   B. HAVE STUDENTS PRACTICE BUILDING DOOR FRAMES AND HANGING DOORS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST AND EXPLAIN THE STEPS INVOLVED IN CONSTRUCTING AND INSTALLING FLOOR FRAMING AND SUB-FLOORING WITH 95% ACCURACY.

2. HAVE EACH STUDENT MAKE A SCALE MODEL OF A PROPOSED BUILDING FROM A BLUEPRINT OR WORKING DRAWING THAT INCLUDES WALL, CEILING AND ROOF FRAMING. THE EVALUATION SHOULD BE BASED UPON THE ACCURACY OF THE MEASUREMENTS AND CUTTING DONE BY THE STUDENT. IT WOULD BE MORE DESIRABLE TO HAVE THE STUDENT EXHIBIT HIS COMPETENCY ON AN ACTUAL STRUCTURE.

3. HAVE EACH STUDENT LAY ASPHALT SHINGLES OR OTHER AVAILABLE ROOFING MATERIAL ON A PREPARED ROOF SECTION. EVALUATION SHOULD BE BASED UPON THE STUDENT'S ABILITY TO CORRECTLY FOLLOW RECOMMENDED PROCEDURES.

4. DEVELOP A TEST USING SLIDES OF BUILDINGS WITH VARIOUS TYPES OF EXTERIOR FINISHES AND HAVE STUDENTS INDICATE THE NAME OF THE MATERIAL USED FOR EXTERIOR SURFACES, AND WHETHER THEY BELIEVE THAT THE INSTALLATION WAS DONE "CORRECTLY" OR "INCORRECTLY." PERFORMANCE SHOULD BE AT THE 95% LEVEL.

5. HAVE EACH STUDENT BUILD A DOOR FRAME AND HANG A DOOR ACCORDING TO RECOMMENDED PROCEDURES. EVALUATION SHOULD BE BASED UPON THE STUDENTS ABILITY TO FOLLOW THE RECOMMENDED PROCEDURES AND WHETHER THE DOOR IS "SQUARE" AND PLUMB.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. VARIOUS TYPES OF DESCRIPTIONS OF ROOFING AND FLOORING MATERIALS
2. HOUSE PLANS OR BLUEPRINTS OF FARM BUILDINGS
3. LUMBER FOR CONSTRUCTION
4. GUTTER MATERIAL
5. HAND AND POWER TOOLS USED IN BUILDING CONSTRUCTION
6. NAILS AND OTHER COMMONLY USED TYPES AND SIZES OF HARDWARE

F. EXAMPLES OF SUPPORTING REFERENCES

1. APPLYING ASPHALT ROOFING AND SIDING PRODUCTS. VAS 3035. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 24 PAGES.

   A DETAILED REFERENCE UNIT WRITTEN FOR STUDENT AND TEACHER USE WHICH COVERS FIGURING AMOUNTS OF ROOFING NEEDED, PREPARING FOR ROOFING, LAYING SHINGLES, AND APPLYING ASPHALT SIDING.

2. PHIPPS, LLOYD J. MECHANICS IN AGRICULTURE. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1967, PP. 561-584.

GIVES A GENERAL OVERVIEW OF CONSTRUCTION AND REPAIR TECHNIQUES FOR AGRICULTURAL BUILDINGS.

3. RESOURCE UNIT ON CONSTRUCTION AND MAINTENANCE SKILLS FOR CORE CURRICULUM. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, U-IVERSITY OF ARIZONA. 1970, PP. 35-93.

A COMPREHENSIVE UNIT ON "LAYING OUT AND SQUARING" THAT WOULD BE USEFUL FOR STUDENTS WHEN COVERING THE OBJECTIVES OF THIS UNIT.

4. USE OF THE SQUARE IN FARM CONSTRUCTION. VAS 3009. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 20 PAGES.

A COMPREHENSIVE REFERENCE UNIT WITH TECHNICAL CONTENT COVERING LAYING OUT BRACES, STAIRS AND RAFTERS, USING THE STEPPING-OFF METHOD, AND DETERMINING LENGTH OF BRACES AND RAFTERS.

USING CONCRETE ON THE FARM

UNIT CONCEPT: CONCRETE PROPERLY SELECTED FOR THE JOB IN CORRECT PROPORTIONS, POURED AND FINSIHED ACCORDING TO RECOMMENDED PROCEDURES, WILL RESULT IN A STRUCTURE WITH DURABILITY, STRENGTH AND A LONG LIFE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. GIVEN A PARTICULAR FARMING OPERATION, PLAN WHAT CONCRETE INSTALLATIONS ARE NECESSARY TO MEET THE NEEDS OF THE OPERATION.

2. WHEN GIVEN A CONCRETE STRUCTURE TO BUILD, ASSIST IN THE BUILDING OF FORMS IN SUCH A WAY THAT THE STRUCTURE WILL RESULT IN THE INTENDED STRENGTH AND SHAPE.

3. WHEN GIVEN CONCRETE FORMS PREPARED FOR THE PLACING OF CONCRETE, ASSIST IN PLACING THE CONCRETE IN SUCH A WAY THAT THE STRUCTURE WILL RESULT IN THE INTENDED SHAPE AND STRENGTH.

4. GIVEN A FRESHLY POURED STRUCTURE, FINISH THE CONCRETE TO PROVIDE THE DESIRED SURFACE.

5. WHEN GIVEN A FRESHLY FINISHED STRUCTURE, CURE AND REMOVE THE FORMS FROM THE CONCRETE TO PRODUCE A LONG LASTING STRUCTURE.

B. INSTRUCTIONAL AREAS

1. PLANNING CONCRETE INSTALLATIONS

    A. DETERMINING TYPE OF STRUCTURE NEEDED

    B. SELECTING CONCRETE MIX NECESSARY TO MEET THE DEMANDS OF THE STRUCTURES INTENDED USE

    C. ESTIMATING THE AMOUNT OF CONCRETE NEEDED

    D. DETERMINING THE COST OF CEMENT AND OTHER RAW MATERIALS NEEDED

2. CONSTRUCTING FORMS FOR CONCRETE INSTALLATIONS

A. IMPORTANCE OF WELL-CONSTRUCTED FORMS

B. SELECTING MATERIALS FOR MAKING CONCRETE FORMS

C. DETERMINING SIZE AND TYPE OF FORMS NEEDED

D. PROCEDURES FOR CONSTRUCTING FORMS

E. PLACING REINFORCING STEEL IN FORMS

3. MIXING AND PLACING CONCRETE

A. DETERMINING WATER-CEMENT-AGGREGATE PROPORTIONS NEEDED

B. PREPARING TO MIX CONCRETE

C. MIXING PROCEDURES FOR QUALITY CONCRETE

D. TRANSPORTING CONCRETE TO INSTALLATION SITE

E. PLACING CONCRETE MIXTURES IN FORMS

4. FINISHING CONCRETE INSTALLATIONS

A. SELECTING EQUIPMENT FOR FINISHING CONCRETE INSTALLATIONS

B. PROVIDING FOR CONSOLIDATION OF CONCRETE

C. STRIKING OFF OR LEVELING CONCRETE

D. EDGING AND JOINTING CONCRETE

E. FLOATING CONCRETE TO REMOVE SLIGHT IMPERFECTIONS

F. TROWELING OF FINAL FINISHING FOR DESIRED TEXTURE

5. CURING CONCRETE

A. DETERMINING METHODS OF CURING

B. IDENTIFYING GENERAL CURING REQUIREMENTS

C. SELECTING COVERING MATERIAL NEEDED FOR CURING

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. GIVE STUDENTS SPECIFIC SITUATION AND HAVE THEM DETERMINE THE TYPE AND SIZE OF CONCRETE INSTALLATIONS NECESSARY TO MEET THE NEEDS OF THE SITUATION.

2. CHECK FORMS WHICH HAVE BEEN BUILT TO SEE THAT THEY ARE CLEAN, TIGHT, ADEQUATELY BRACED, AND CONSTRUCTED OF MATERIALS THAT WILL IMPART THE DESIRED TEXTURE TO THE FINISHED CONCRETE.

3. HAVE STUDENTS PRACTICE PLACING CONCRETE IN FORMS USING A SPADE OR VIBRATOR TO ELIMINATE VOIDS AT THE SIDES.

4. A. STRIKE OFF OR SCREED THE CONCRETE SURFACE TO REMOVE HUMPS AND HOLLOWS.

   B. STUDENTS SHOULD PRACTICE USING A DARBY OR BULL FLOAT TO ELIMINATE THE RIDGES AND VOIDS LEFT BY THE STRIKE OFF OPERATION.

5. HAVE STUDENTS LOOK AT CONCRETE INSTALLATIONS AND DETERMINE IF CRACKS AND IMPERFECTIONS MIGHT HAVE BEEN CAUSED BY IMPROPER CURING.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS LIST THE FACTORS TO CONSIDER WHEN PLANNING CONCRETE INSTALLATIONS. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) TYPE OF STRUCTURES NEEDED, (2) CONCRETE MIXES NECESSARY FOR THE SPECIFIC INSTALLATION, AND (3) COST OF CONCRETE INSTALLATION.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO CONSTRUCT A FORM DESIGNED TO PROVIDE A CONCRETE STRUCTURE OF A PARTICULAR SIZE AND SHAPE WITH COMPLETE ACCURACY.

3. EACH STUDENT SHOULD BE ABLE TO CORRECTLY DESCRIBE THE PROPER PROCEDURE FOR PLACING CONCRETE IN FORMS.

4. USING A SECTION OF POURED CONCRETE, HAVE EACH STUDENT DEMONSTRATE THE PROPER PROCEDURE FOR FINISHING THE CONCRETE TO A PREDETERMINED TEXTURE TO THE SATISFACTION OF THE INSTRUCTOR.

5. EACH STUDENT SHOULD CORRECTLY EXPLAIN THE GENERAL REQUIREMENTS FOR CURING CONCRETE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TRANSIT OR FARM LEVEL

2. MATERIAL FOR CONSTRUCTION OF FORMS

3. INGREDIENTS FOR MIXING CONCRETE

4. NECESSARY TOOLS AND EQUIPMENT FOR MIXING, PLACING, FINISHING, AND CURING CONCRETE

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONCRETE TECHNOLOGY, INSTRUCTOR'S GUIDE. SILVER SPRINGS, MARYLAND: PORTLAND CEMENT ASSOCIATION. 1965, 264 PAGES.

   A COMPREHENSIVE TEACHER'S GUIDE WHICH INCLUDES TECHNICAL CONTENT DEALING WITH MOST ALL ASPECTS OF USING CONCRETE.

2. HOW TO CONSTRUCT QUALITY CONCRETE. TUCSON, ARIZONA: AGRICULTURAL EDUCATION DEPARTMENT, UNIVERSITY OF ARIZONA. 1972, 100 PAGES.

   A REFERENCE UNIT WHICH PROVIDES TECHNICAL CONTENT SUFFICIENT TO COVER THE OBJECTIVES OF THIS UNIT. MATERIAL COVERS INCLUDES: MIXING CONCRETE, CONSTRUCTING FORMS, REINFORCING, PLACING CONCRETE, AND FINISHING AND CURING CONCRETE.

3. MAKING AND USING CONCRETE ON THE FARM. VAS 3007. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 16 PAGES.

   THIS REFERENCE GIVES AN ITEMIZED PROCEDURE AS WELL AS A BRIEF EXPLANATION OF MIXING, PLACING, FINISHING, AND CURING CONCRETE.

PLANNING FOR FEEDLOT NEEDS

UNIT CONCEPT: A WELL DESIGNED FEEDLOT WILL RESULT IN THE USE OF FEED AND HANDLING EQUIPMENT, SHELTER, STORAGE, ANIMAL SPACE AND A MANURE DISPOSAL SYSTEM WHICH MAXIMUZES FEED AND LABOR EFFICIENCY AND INCREASES PROFITS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE TYPE AND SIZE OF A FEEDING OPERATION, PLAN THE LIVESTOCK HANDLING FACILITIES NECESSARY FOR EFFICIENT MOVEMENT AND CARE OF LIVESTOCK TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN GIVEN THE TYPE AND SIZE OF A FEEDING OPERATION, PLAN THE FEED DISTRIBUTION SYSTEM NECESSARY FOR EFFICIENT FEED HANDLING WITH THE MINIMUM OF LABOR.

3. WHEN GIVEN THE TYPE AND SIZE OF A FEEDING OPERATION, SELECT AN EFFICIENT FEED PROCESSING SYSTEM WHICH WILL PROVIDE THE DESIRED FEED MIX IN THE DESIRED FORM.

4. WHEN GIVEN THE TYPE AND SIZE OF A FEEDING OPERATION, PLAN THE DESIRED TYPE OF MANURE HANDLING WHICH WILL PROTECT THE STREAMS FROM POLLUTION AS RECOMMENDED BY LAW.

B. INSTRUCTIONAL AREAS

1. PLANNING THE CATTLE HANDLING FACILITIES

    A. SELECTING THE SITE

    B. SELECTING THE SURFACING

    C. PLANNING THE WATERER LOCATIONS

    D. SELECTING THE FENCES

    E. DETERMINING THE SPACE REQUIREMENTS/HEAD

    F. PLANNING THE LANES AND ALLEYS

    G. PLANNING THE WORKING CORRALS

H. DETERMINING COSTS AND RETURNS

2. PLANNING FEED DISTRIBUTION SYSTEMS

   A. SELECTING THE TYPE OF FEEDER

   B. SELECTING THE METHOD OF FILLING FEEDERS

   C. DETERMINING COSTS AND RETURNS

3. PLANNING FEED PROCESSING SYSTEMS

   A. SELECTING THE METHODS OF PROCESSING FEEDS

   B. SELECTING THE MACHINE FOR PARTICLE SIZE REDUCTION

   C. SELECTING ELEVATORS AND CONVEYORS

   D. DETERMINING THE SIZE AND TYPE OF FEED STORAGE FACILITIES

   E. DETERMINING COST AND RETURNS

4. PLANNING THE MANURE HANDLING SYSTEM

   A. SELECTING THE TYPE OF MANURE DISPOSAL SYSTEM BEST SUITED FOR THE OPERATION

   B. DETERMINING THE COSTS AND EFFECTIVENESS OF VARIOUS SYSTEMS AND IF THEY MEET THE STANDARDS SET BY LAW

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. VISIT A NEARBY FEED LOT AND HAVE THE STUDENTS NOTE THE METHODS USED IN HANDLING THE LIVESTOCK, FEED, AND MANURE DISPOSAL AND HAVE CLASS MEMBERS REPORT ON ADVANTAGES AND DISADVANTAGES OF THE SYSTEM OBSERVED.

   B. INVITE A SALES REPRESENTATIVE OF AN EQUIPMENT COMPANY TO GIVE A PRESENTATION TO THE CLASS ON THEIR NEWEST TYPES OF MATERIALS HANDLING EQUIPMENT, LIVESTOCK HANDLING EQUIPMENT, AND MANURE DISPOSAL EQUIPMENT.

2. HAVE STUDENTS STUDY AND ANALYZE VARIOUS FEED DISTRIBUTION SYSTEMS USED FOR FEEDLOTS AND MAKE A CHART FOR COMPARISON OF COST OF INSTALLATION, MAINTENANCE NEEDS - LONG AND SHORT TERM, AND AMOUNT OF LABOR NEEDED TO OPERATE THE SYSTEMS.

3. USING PICTURES, SLIDES OR OTHER VISUALS OF FEED PROCESSING EQUIPMENT, HAVE STUDENTS OUTLINE THE ADVANTAGES AND DISADVANTAGES OF EACH PIECE OF EQUIPMENT STUDIED.

4. INVITE A SOIL CONSERVATION SERVICE REPRESENTATIVE TO SPEAK TO THE CLASS CONCERNING THE NEW POLLUTION LAWS AND THE TYPES OF DESIGNS NECESSARY FOR MANURE DISPOSAL WHICH WILL MEET THE NEW REQUIREMENTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. USING VARIOUS SIZES AND TYPES OF LIVESTOCK OPERATIONS, HAVE STUDENTS DESCRIBE THE HANDLING FACILITIES NEEDED TO EFFICIENTLY AND ECONOMICALLY HANDLE THE LIVESTOCK. EVALUATION SHOULD BE BASED UPON EFFICIENT USE OF AVAILABLE RESOURCES AND APPROPRIATENESS OF THE FACILITIES FOR THE PARTICULAR SITUATIONS.

2. HAVE EACH STUDENT LIST THE FACTORS TO CONSIDER WHEN PLANNING FEED DISTRIBUTION SYSTEMS FOR FEEDLOT FACILITIES. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) AMOUNT OF FEED TO BE DISTRIBUTED, (2) COST OF INSTALLATION, (3) LABOR REQUIREMENTS, (4) NUMBER OF LIVESTOCK TO BE SERVED, AND (5) STORAGE FACILITIES NEEDED.

3. HAVE EACH STUDENT CORRECTLY FIGURE THE SIZE OF FEED MIXER NEEDED FOR A PARTICULAR SIZE FEEDLOT OPERATION CONSIDERING THE VOLUME OF FEED TO BE PROCESSED.

4. GIVE STUDENTS THE NUMBER OF LIVESTOCK TO BE HANDLED AND HAVE THEM CORRECTLY FIGURE THE SIZE OF MANURE HANDLING FACILITY NEEDED TO MEET FEDERAL, STATE AND LOCAL REGULATIONS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. TABLES WITH INFORMATION CONCERNING THE SPACE REQUIREMENTS FOR LIVESTOCK AND FEED

2. CATALOGS ON VARIOUS TYPES OF FEED LOT EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. BEEF HANDBOOK HOUSING AND EQUIPMENT. AMES, IOWA: MIDWEST PLAN SERVICE, IOWA STATE UNIVERSITY. 1968, 64 PAGES.

   A COMPREHENSIVE REFERENCE WHICH COVERS FEEDLOT PLANNING, INCLUDING WASTE DISPOSAL, FEEDING SYSTEMS, AND EQUIPMENT NECESSARY FOR VARIOUS FEEDLOT SYSTEMS.

2. ENSMINGER, M.E. THE STOCKMAN'S HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1959, PP. 336-368.

   THIS SECTION ON BUILDINGS AND EQUIPMENT INCLUDES CONTENT ON FEEDLOT FACILITIES ALTHOUGH DUE TO PUBLICATION DATE, SOME OF THE MATERIAL MAY NEED TO BE UPDATED TO BE IN LINE WITH THE LATEST TECHNIQUES.

FENCE CONSTRUCTION AND MAINTENANCE

UNIT CONCEPT: THE PROPER SELECTION AND CONSTRUCTION OF A FENCE WILL AID IN THE DESIRED CONTAINMENT OF LIVESTOCK AND CONVENIENCE FOR THE OPERATOR.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH AN AERIAL MAP OF A FARM AND INFORMATION RELATING TO THE FARMING PROGRAM, PLAN THE FENCE LAYOUT TO FIT THE CROPPING PLAN AND ARRANGE THE FIELDS AND PASSAGEWAYS FOR CONVENIENCE AND FOR SAVING LABOR.
2. WHEN GIVEN THE TYPE OF LIVESTOCK AND THE DIMENSIONS TO BE FENCED, DETERMINE THE TYPE AND QUANTITY OF FENCING MATERIALS NEEDED TO CONSTRUCT THE FENCE TO THE SATISFACTION OF THE INSTRUCTOR.
3. WHEN GIVEN THE NECESSARY EQUIPMENT AND MATERIALS, LAY OUT A FENCE LINE OF TEN OR MORE RODS, PROPERLY BRACE THE ENDS AND CORNERS, AND STRETCH AND ATTACH THE FENCE ACCORDING TO RECOMMENDED PROCEDURES.
4. WHEN GIVEN THE NECESSARY EQUIPMENT AND MATERIALS, CONSTRUCT AND/OR MOUNT A GATE WHICH SWINGS FREELY WITHOUT SAGGING.
5. WHEN GIVEN THE NECESSARY EQUIPMENT AND MATERIALS, CONSTRUCT A CATTLE GUARD WHICH ALLOWS EQUIPMENT TO CROSS BUT NOT CATTLE ACCORDING TO RECOMMENDED PROCEDURES.

B. INSTRUCTIONAL AREAS

1. PLANNING THE FENCING LAYOUT FOR A FARM
    A. SKETCHING THE FARM LAYOUT
    B. PLOTTING THE LAND CAPABILITY
    C. DIVIDING AREA INTO SIZE AND NUMBER OF FIELDS FOR CROPPING SYSTEM
    D. SKETCHING PROPOSED LAND CONNECTING FARM BUILDINGS AND PASTURES

E. DETERMINING LOCATION OF GATES AND OTHER PASSAGEWAYS

F. DETERMINING THE TYPE OF FENCE NEEDED

(1) PERMANENT FENCES
(2) MOVABLE FENCES

2. SELECTING THE WIRE FOR DIFFERENT CLASSES OF LIVESTOCK

3. SELECTING POSTS

A. AVAILABILITY AND COST

B. LENGTH OF SERVICE DESIRED

C. KIND AND AMOUNT OF LIVESTOCK

D. COST OF INSTALLATION

4. CONSTRUCTING A WOVEN WIRE FENCE

A. PREPARING THE FENCE LINE

B. MAKING CONCRETE FOOTINGS

C. SETTING AND BRACING CORNER, END, AND GATE POSTS IN CONCRETE

D. LOCATING LINE POSTS

E. SETTING LINE POSTS

F. GROUNDING FOR LIGHTNING PROTECTION

5. STRETCHING THE FENCE

A. ATTACHING THE FENCING TO END POSTS

B. UNROLLING THE FENCE

C. ATTACHING CHAIN-TYPE STRETCHERS AND STRETCHING

D. SECURING TO END POSTS

E. FASTENING TO LINE POSTS

6. CONSTRUCTING A BARBED WIRE FENCE

A. UNROLLING

B. STRETCHING

7. CONSTRUCTING ELECTRIC FENCES
    - A. SELECTING SAFE FENCE CONTROLLERS
    - B. DETERMINING WIRE HEIGHT
    - C. SELECTING POSTS, WIRE, AND INSULATORS
    - D. GROUNDING THE CONTROLLER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. INVITE THE SOIL CONSERVATION SERVICE TO SPEAK TO THE CLASS CONCERNING THE PLANNING OF FARM FENCING AND THEIR REIMBURSEMENT PROGRAM.

   B. USING AERIAL PHOTOGRAPHS OF FARMS IN THE AREA, DETERMINE THE FENCING NEEDS OF VARIOUS FARMS WITH DIFFERENT TYPES OF LIVESTOCK.

2. USING PICTURES, SLIDES OR ACTUAL SAMPLES OF VARIOUS FENCING MATERIALS, HAVE STUDENTS LIST THE ADVANTAGES AND DISADVANTAGES OF EACH.

3. HAVE STUDENTS PRACTICE LAYING OUT AND CONSTRUCTING A FENCE LINE. THIS ACTIVITY SHOULD BE DONE WITH AT LEAST TWO DIFFERENT KINDS OF FENCING MATERIALS SUCH AS WOVEN WIRE AND BARBED WIRE.

4. HAVE GROUPS OF STUDENTS CONSTRUCT AND MOUNT GATES ON VARIOUS TYPES OF FENCING ARRANGEMENTS.

5. HAVE STUDENTS ANALYZE VARIOUS STYLES OF CATTLE GUARDS AND THEN DETERMINE THE ONE OR TWO TYPES THAT ARE THE MOST EFFICIENT AND ECONOMICAL.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS LIST THE FACTORS TO CONSIDER WHEN PLANNING FENCING NEEDS. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) SIZE AND ARRANGEMENT OF FIELDS, (2) TYPE OF FARMING OPERATION, (3) NUMBER OF GATES AND PASSAGEWAYS, AND (4) FINANCIAL RESOURCES AVAILABLE.

2. DEVELOP A MATCHING TEST WITH TYPE OF FENCE IN ONE COLUMN (BARBED WIRE, WOVEN WIRE, BOARD) AND VARIOUS TOOLS AND EQUIPMENT USED IN FENCE CONSTRUCTION IN THE OTHER COLUMN. STUDENTS SHOULD BE ABLE TO MATCH THE VARIOUS TOOLS AND/OR EQUIPMENT WITH THE TYPE OF FENCE WITH 95% ACCURACY.

3. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO LAY OUT A FENCE LINE, BRACE THE ENDS AND CORNERS, AND STRETCH AND ATTACH THE FENCE TO THE SATISFACTION OF THE INSTRUCTOR.

4. EACH STUDENT SHOULD DEMONSTRATE HIS ABILITY TO MOUNT A GATE THAT DOES NOT SAG, ACCORDING TO RECOMMENDED PROCEDURES WITH COMPLETE ACCURACY.

5. EACH STUDENT SHOULD BE ABLE TO FIGURE THE DIMENSIONS OF A CATTLE GUARD WHICH ALLOWS FOR THE PASSAGE OF MACHINERY AND EQUIPMENT BUT DOES NOT ALLOW LIVESTOCK TO PASS WITH COMPLETE ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. AERIAL PHOTOGRAPHS OF THE AREA
2. HAND TOOLS FOR CLEARING THE FENCE LINE
3. TOOLS AND MATERIALS FOR POST ALIGNMENT AND PLACEMENT
4. FENCING MATERIAL AND POSTS
5. DOUBLE JACK FENCE STRETCHER

F. EXAMPLES OF SUPPORTING REFERENCES

1. BUILDING FARM FENCES. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1969, 33 PAGES.

   COVERS THE ACTUAL PROCEDURES FOR CONSTRUCTING WOVEN WIRE, BARBED WIRE, MOVABLE AND BOARD FENCES, INCLUDING TOOLS AND EQUIPMENT NEEDED.

2. ENSMINGER, M.E. THE STOCKMAN'S HANDBOOK. DANVILLE, ILLINOIS: THE INTERSTATE PRINTERS AND PUBLISHERS, INC. 1959, PP. 377-386.

   COVERS THE GENERAL PRINCIPLES AND TECHNIQUES OF PLANNING, LAYING OUT, AND CONSTRUCTING FENCES.

3. PLANNING FARM FENCES. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1966, 53 PAGES.

   THIS REFERENCE WOULD BE GOOD FOR STUDENT USE AND COVERS MATERIAL CONCERNING PLANNING LOCATION AND ARRANGEMENT OF FENCES, DETERMINING KIND OF FENCE TO USE, SELECTING FENCING MATERIALS, AND DETERMINING NUMBER AND KIND OF LINE AND CORNER POSTS TO USE.

OPERATION AND CARE OF SMALL GASOLINE ENGINES

UNIT CONCEPT: PROPER STARTING, OPERATION, CLEANING AND STORAGE OF SMALL GASOLINE ENGINES WILL RESULT IN INCREASED ENGINE EFFICIENCY AND LONGER LIFE WITH A MINIMUM OF ANNOYANCE AND EXPENSE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE TWO BASIC TYPES OF SMALL GASOLINE ENGINES AND EXPLAIN THEIR PRINCIPLES OF OPERATION WITH ACCURACY NEEDED TO DIFFERENTIATE BETWEEN THEM.
2. USE THE PROPER PROCEDURES FOR PREPARING TO START AND STARTING A SMALL GASOLINE ENGINE INCLUDING REFUELING TO PREVENT STARTING TROUBLES AND ACCIDENTS.
3. OPERATE, ADJUST ENGINE SPEED AND LOAD, AND STOP SMALL GASOLINE ENGINES USING PROCEDURES WHICH PROMOTE OPTIMUM ENGINE EFFICIENCY AND OPERATOR SAFETY.
4. PROPERLY CLEAN A SMALL GASOLINE ENGINE TO PREVENT OVERHEATING AND EXCESSIVE WEAR DUE TO DIRT ENTERING THE ENGINE.
5. PREPARE A SMALL GASOLINE ENGINE PROPERLY FOR STORAGE OF THREE OR MORE MONTHS DURATION TO PREVENT CORROSION AND DAMAGE.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING TYPES OF SMALL GASOLINE ENGINES
    - A. IDENTIFYING OPERATING PRINCIPLES OF FOUR STROKE CYCLE ENGINES
    - B. IDENTIFYING OPERATING PRINCIPLES OF TWO STROKE CYCLE ENGINES
    - C. IDENTIFYING SPECIFIC USES OF EACH TYPE OF ENGINE
2. PREPARING SMALL GASOLINE ENGINES FOR STARTING
    - A. REFUELING

- (1) SELECTING THE FUEL
- (2) MIXING THE OIL-GASOLINE MIXTURE FOR A TWO STROKE CYCLE ENGINE
- (3) FILLING THE TANK USING PROPER SAFETY PRECAUTIONS

B. STARTING

- (1) IDENTIFYING SAFETY PRECAUTIONS
- (2) CHECKING REQUIRED SERVICING
- (3) OPERATING STARTING MECHANISMS

3. OPERATING A SMALL GASOLINE ENGINE

A. SELECTING PROPER SPEED

B. SELECTING PROPER LOAD

C. CORRELATING ENGINE TYPE TO SLOPE AND OTHER WORKING CONDITIONS

D. STOPPING THE ENGINE

4. CLEANING SMALL GASOLINE ENGINES

A. CLEANING THE OUTSIDE OF THE ENGINE

B. CLEANING THE MUFFLER AND/OR EXHAUST PORTS

C. CLEANING THE COOLING SYSTEM

5. STORING THE ENGINE

A. PREVENTING CORROSION AND MOISTURE BUILD-UP

B. PREVENTING GUM DEPOSITS

C. PREVENTING DUST BUILD-UP AND PHYSICAL DAMAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. USE CUT AWAY MODELS OF TWO AND FOUR CYCLE ENGINES TO OBSERVE DIFFERENCES IN THEIR OPERATING PRINCIPLES.

2. A. MAKE A CHECK LIST OF SAFETY PROCEDURES TO FOLLOW BEFORE, DURING, AND AFTER STARTING A SMALL ENGINE.

   B. PREPARE A FUEL MIXTURE FOR A TWO STROKE CYCLE ENGINE

3. COMPARE OPERATING INSTRUCTIONS IN OPERATORS' MANUALS OF TWO AND FOUR STROKE CYCLE ENGINES AND NOTE DIFFERENCES IN RECOMMENDATIONS.

4. BRING IN EXAMPLES OF POORLY CARED FOR ENGINES FOR THE STUDENTS TO CLEAN.

5. USE A SMALL GASOLINE ENGINE THAT WILL BE STORED FOR A LONG PERIOD OF TIME TO DEMONSTRATE CORRECT PROCEDURES TO USE TO PREPARE AN ENGINE FOR STORAGE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP AN ESSAY TEST IN WHICH THE STUDENTS WILL INDICATE THE BASIC DIFFERENCES BETWEEN TWO AND FOUR STROKE CYCLE ENGINES.

2. HAVE THE STUDENTS LIST THE PROCEDURES TO FOLLOW WHEN REFUELING SMALL GASOLINE ENGINES WHICH SHOULD INCLUDE SAFETY PRECAUTIONS.

3. HAVE EACH STUDENT OPERATE A SMALL GASOLINE ENGINE UNDER WORKING CONDITONS. EVALUATE THE STUDENT IN RELATION TO PROPER LOAD AND SPEED ADJUSTMENT AND SAFETY PROCEDURES.

4. HAVE THE STUDENTS LIST THE PROCEDURES THAT SHOULD BE FOLLOWED WHICH WILL HELP PREVENT ENTRANCE OF DIRT INTO THE ENGINE.

5. HAVE THE STUDENTS DESCRIBE THE PROCEDURE THEY WOULD FOLLOW TO PREPARE A SMALL GASOLINE ENGINE FOR STORAGE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SMALL ENGINE HAND TOOLS

2. CUT AWAY MODELS OF TWO AND FOUR STROKE CYCLE ENGINES

3. AIR COMPRESSOR

4. "DEGREASER" SOLVENTS

5. SMALL ENGINES IN GOOD AND POOR CONDITION

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMALL ENGINES. VOLUME I. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1968, 150 PAGES.

   THIS BOOKLET CONTAINS A COMPLETE DISCUSSION OF PROCEDURES FOR OPERATING AND CARING FOR SMALL GASOLINE ENGINES AND WOULD BE OF VALUE AS A STUDENT TEXT.

MAINTENANCE OF SMALL GASOLINE ENGINES

UNIT CONCEPT: REGULAR MAINTENANCE WHICH INCLUDES CLEANING THE CARBURETOR AIR CLEANER, CLEANING THE FUEL STRAINER, SELECTING AND CHANGING CRANKCASE OIL, AND SERVICING THE SPARK PLUG IS NEEDED TO OBTAIN TROUBLE-FREE SERVICE, GREATER ENGINE EFFICIENCY AND LONGER LIFE FROM SMALL GASOLINE ENGINES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. IDENTIFY THE DIFFERENT TYPES OF CARBURETOR AIR CLEANERS COMMONLY FOUND ON SMALL GASOLINE ENGINES AND CLEAN AND SERVICE THEM ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

2. IDENTIFY THE THREE BASIC TYPES OF FUEL STRAINERS COMMONLY FOUND ON SMALL GASOLINE ENGINES AND CLEAN AND SERVICE THEM ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

3. SELECT THE RIGHT OIL, KEEP THE PROPER CRANKCASE OIL LEVEL, AND CHANGE THE OIL IN A FOUR STROKE CYCLE ENGINE ACCORDING TO MANUFACTURER'S SPECIFICATIONS FOR SMALL GASOLINE ENGINES.

4. SELECT AND SERVICE THE SPARK PLUG ON TWO AND FOUR STROKE CYCLE ENGINES ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

5. IDENTIFY THE PRINCIPLES OF CARBURETOR OPERATION IN SMALL GASOLINE ENGINES AND MAKE CARBURETOR ADJUSTMENTS FOR MOST EFFICIENT PERFORMANCE.

B. INSTRUCTIONAL AREAS

1. SERVICING CARBURETOR AIR CLEANERS

   A. IDENTIFYING THE TYPES OF CARBURETOR AIR CLEANERS

      (1) OIL-BATH TYPE
      (2) OILED FILTER TYPE
      (3) DRY FILTER TYPE

B. IDENTIFYING REASONS FOR SERVICING AIR CLEANERS

C. IDENTIFYING METHODS OF SERVICING EACH AIR CLEANER TYPE

2. SERVICING FUEL STRAINERS

A. IDENTIFYING TYPES OF FUEL STRAINERS

B. IDENTIFYING PROCEDURES FOR CLEANING FUEL STRAINERS

3. LUBRICATING FOUR STROKE CYCLE ENGINES

A. DETERMINING THE IMPORTANCE OF PROPER LUBRICATION

B. SELECTING CRANKCASE OIL

(1) SINGLE VISCOSITY OILS
(2) MULTI-VISCOSITY OILS

C. CHANGING CRANKCASE OIL

D. CHECKING CRANKCASE OIL LEVEL

4. SERVICING SPARK PLUGS

A. IDENTIFYING THE TYPES OF SPARK PLUGS

(1) HOT AND COLD PLUGS
(2) LENGTH OF REACH

B. SELECTING THE PROPER PLUG TO MEET ENGINE CONDITIONS

C. INSPECTING AND MAINTAINING SPARK PLUGS

5. ADJUSTING CARBURETORS

A. IDENTIFYING THE BASIC PRINCIPLES OF CARBURETION

B. IDENTIFYING THE COMMON TYPES OF SMALL GASOLINE ENGINE CARBURETORS

C. MAKING CARBURETOR ADJUSTMENTS

(1) IDLE SPEED SCREW
(2) LOW SPEED NEEDLE
(3) HIGH SPEED NEEDLE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. DEMONSTRATE THE EFFECTS OF A DIRTY AIR CLEANER ON ENGINE PERFORMANCE BY PARTIALLY BLOCKING THE AIR INTAKE TO THE

CARBURETOR AND LISTENING TO THE RESULTING ENGINE PERFORMANCE AND OBSERVING THE EFFECTS ON THE ENGINE'S POWER.

2. PRACTICE CLEANING DIFFERENT TYPES OF FUEL STRAINERS.

3. A. CONDUCT A DEMONSTRATION USING VARIOUS VISCOSITY GRADES OF OIL AND DETERGENT AND NON-DETERGENT OIL TO INDICATE DIFFERENCES IN OIL PERFORMANCE UNDER DIFFERENT ENGINE CONDITONS.

   B. CHANGE THE OIL IN A FOUR STROKE CYCLE ENGINE.

4. CLEAN AND SET A SPARK PLUG ACCORDING TO THE OPERATOR'S MANUAL USING A FEELER GAUGE.

5. A. DETERMINE IF THE CARBURETOR ON A SMALL GASOLINE ENGINE IS FUNCTIONING PROPERLY BY STARTING THE ENGINE AND OBSERVING PERFORMANCE AND EXHAUST WHEN THE THROTTLE IS RAPIDLY ADVANCED.

   B. PRACTICE ADJUSTING ENGINE CARBURETORS ACCORDING TO MANUFACTURER'S SPECIFICATIONS AND BY OBSERVING ENGINE PERFORMANCE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT SERVICE AN AIR CLEANER ON A SMALL GASOLINE ENGINE. EVALUATE THE STUDENT ON HIS CORRECTNESS OF PROCEDURE.

2. HAVE EACH STUDENT LIST THE STEPS TO FOLLOW WHEN SERVICING THE FUEL STRAINER ON A SMALL GASOLINE ENGINE.

3. HAVE EACH STUDENT LIST THE STEPS IN CHANGING OIL IN A SMALL GASOLINE ENGINE.

4. GIVE EACH STUDENT A DIRTY OR WORN SPARK PLUG TO SERVICE OR REPLACE. EVALUATE THE STUDENT ON CORRECTNESS OF PROCEDURE IN SERVICING THE PLUG OR ON SELECTING THE APPROPRIATE REPLACEMENT PLUG.

5. MAKE MALADJUSTMENTS ON A SMALL ENGINE CARBURETOR. HAVE EACH STUDENT RESET THE CARBURETOR SO THAT THE ENGINE RUNS SMOOTHLY AND EFFICIENTLY. EVALUATE THE STUDENT AS TO CORRECTNESS IN PROCEDURE AND THE RESULTING CARBURETOR AND ENGINE PERFORMANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SMALL GASOLINE ENGINES

2. COMMON SMALL GASOLINE ENGINE HAND TOOLS
3. SPARK PLUG FEELER GAUGE
4. CONTAINERS FOR WASHING PARTS
5. DIFFERENT TYPES AND GRADES OF OIL
6. PETROLEUM SOLVENT
7. EXAMPLES OF SPARK PLUGS
8. OPERATOR'S MANUALS
9. IGNITION FILE

F. EXAMPLES OF SUPPORTING REFERENCES

1. SMALL ENGINES. VOLUME I. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION OF VOCATIONAL INSTRUCTIONAL MATERIALS. 1968, 150 PAGES.

   THIS BOOKLET CONTAINS A COMPLETE DISCUSSION OF MAINTENANCE PROCEDURES FOR SMALL GASOLINE ENGINES AND WOULD BE VALUABLE AS A STUDENT TEXT.

SELECTING POWER EQUIPMENT BASED ON NEEDS

UNIT CONCEPT: POWER EQUIPMENT SHOULD BE SELECTED ACCORDING TO THE SIZE OF FARM MACHINERY TO BE USED IN TILLAGE, PLANTING, HARVESTING AND PROCESSING OPERATIONS, AND THE SIZE OF THE FARM OPERATION. DUE TO THE COSTS INVOLVED IN PURCHASING AND OPERATING FARM POWER EQUIPMENT, CAREFUL PLANNING SHOULD BE DONE IN THE SELECTION OF THIS EQUIPMENT TO PROVIDE FOR ECONOMY AND EFFICIENCY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION REGARDING THE SIZE OF THE TILLAGE, PLANTING, HARVESTING AND PROCESSING EQUIPMENT TO BE USED AND THE MAXIMUM NUMBER OF HOURS PER YEAR POWER EQUIPMENT WOULD NEED TO BE USED, DETERMINE THE SIZE AND NUMBER OF UNITS OF FARM POWER EQUIPMENT REQUIRED ACCORDING TO EQUIPMENT MANUFACTURER SPECIFICATIONS AND RECOMMENDATIONS OF FARM POWER EQUIPMENT SPECIALISTS.

2. WHEN PROVIDED WITH INFORMATION REGARDING THE TYPE OF TILLAGE, PLANTING, HARVESTING, PROCESSING AND FERTILIZER AND WEED CONTROL MACHINERY, DETERMINE THE ACCESSORIES REQUIRED ON THE FARM POWER EQUIPMENT, ACCORDING TO EQUIPMENT MANUFACTURER'S SPECIFICATIONS.

3. WHEN PROVIDED WITH INFORMATION REGARDING INITIAL AND OPERATIONAL COSTS OF DIESEL, LP-GAS AND GASOLINE FUEL TYPE FARM POWER EQUIPMENT, AND THE HOURS PER YEAR THE EQUIPMENT WILL BE USED, SELECT THE FUEL TYPE OF POWER EQUIPMENT MOST ECONOMICAL TO USE, ACCORDING TO DATA SUPPLIED BY EQUIPMENT MANUFACTURERS AND RECOMMENDATIONS OF FARM POWER EQUIPMENT ENGINEERS AND LOCAL PRICES AND AVAILABILITY OF FUELS.

4. WHEN GIVEN SEVERAL SOURCES FOR OBTAINING FARM POWER EQUIPMENT, SELECT THE SOURCE THAT WILL PROVIDE THE BEST SERVICE INCLUDING THE READY AVAILABILITY OF REPAIR PARTS, ACCORDING TO INFORMATION OBTAINED FROM LOCAL USERS OF SUCH EQUIPMENT AND THE LOCAL DEALER'S REPUTATION OF PROVIDING SATISFACTORY SERVICE.

B. INSTRUCTIONAL AREAS

1. DETERMINING MAXIMUM SIZE OF EQUIPMENT TO BE USED WITH THE FARM POWER EQUIPMENT

    A. DETERMINING SIZE AND TYPE OF TILLAGE EQUIPMENT

        (1) NUMBER OF PLOW BOTTOMS OF MOLDBOARD PLOWS
        (2) WIDTH IN FEET AND NUMBER OF SECTIONS OF DISC HARROWS
        (3) WIDTH IN FEET AND NUMBER OF SHANKS OF CHISEL PLOWS AND FIELD CULTIVATORS
        (4) WIDTH AND DEPTH CUTTING CAPACITY OF ROTARY TILLERS

    B. DETERMINING SIZE AND TYPE OF PLANTERS AND OTHER SEED PLANTING EQUIPMENT

        (1) SIZE AND TYPE OF PLANTER OR LISTER
        (2) WIDTH IN FEET OF GRAIN DRILLS

    C. DETERMINING SIZE OF HARVESTING EQUIPMENT

        (1) SIZE OF CORN PICKER
        (2) SIZE OF COMBINE
        (3) SIZE OF SHELLER-COMBINE

2. CALCULATING HORSE POWER REQUIREMENTS FOR POWER EQUIPMENT BASED ON SIZE OF MACHINERY TO BE USED

3. CALCULATING NUMBER OF UNITS OF FARM POWER EQUIPMENT BASED ON SIZE OF FARM OPERATION AND NUMBER OF MACHINERY OPERATIONS TO BE PERFORMED

    A. DETERMINING SEASONAL PEAK WORK LOAD REQUIREMENTS

4. SELECTING ACCESSORIES NEEDED ON FARM POWER EQUIPMENT

    A. SURVEYING FARM MACHINERY IN REGARD TO TYPE

    B. EVALUATING FARM POWER EQUIPMENT IN REGARD TO SUITABILITY OF AVAILABLE ACCESSORIES

5. COMPARING INITIAL COSTS OF DIESEL, LP-GAS AND GASOLINE FUEL TYPE FARM POWER EQUIPMENT

    A. COMPARING COSTS BY HORSE POWER SIZE

    B. COMPARING COSTS BY ACCESSORIES AVAILABLE ON EACH TYPE

6. CALCULATING FUEL COSTS OF DIESEL, LP-GAS AND GASOLINE FUEL TYPE FARM POWER EQUIPMENT

   A. DETERMINING GALLONS PER HOUR FOR EACH TYPE TRACTOR BY DIFFERENT HORSE POWER SIZES

   B. CALCULATING COSTS BASED ON CURRENT PRICES FOR FUEL

7. COMPARING SOURCES FOR OBTAINING FARM POWER EQUIPMENT

   A. COMPARING COSTS OF DIFFERENT MAKES OF FARM POWER EQUIPMENT

   B. COMPARING SERVICES AVAILABLE

      (1) REPAIR SERVICES
      (2) AVAILABILITY OF PARTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS MAKE AN INVENTORY OF THE TILLAGE, PLANTING, HARVESTING, PROCESSING AND FERTILIZER AND WEED CONTROL EQUIPMENT OF A FARM BUSINESS OPERATION AND FROM THIS INVENTORY PRACTICE SELECTION OF THE SIZE AND NUMBER OF UNITS OF FARM POWER EQUIPMENT NEEDED.

2. HAVE STUDENTS PREPARE A LIST OF THE TILLAGE, PLANTING, HARVESTING, PROCESSING AND WEED CONTROL EQUIPMENT USED IN THE AREA, OPPOSITE THE NAME OF EACH EQUIPMENT TYPE LIST THE FARM POWER EQUIPMENT ACCESSORIES REQUIRED.

3. HAVE STUDENTS PREPARE AN INFORMATION SHEET FOR COMPARING DIESEL, LP-GAS AND GASOLINE FUEL TYPE TRACTOR COSTS BY USING THE FOLLOWING COLUMN HEADINGS - FUEL TYPE, HORSEPOWER SIZE, INITIAL COSTS, FUEL CONSUMPTION PER HOUR, FUEL COST PER HOUR.

4. HAVE STUDENTS SURVEY THE FARM POWER EQUIPMENT DEALERS OF THE AREA AND PREPARE AN INFORMATION SHEET IN REGARD TO KINDS AND SIZES OF FARM POWER EQUIPMENT AVAILABLE, COSTS, EVALUATION OF SERVICES AND REPAIR PARTS AVAILABLE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PREPARE A SELECTED LIST OF TILLAGE, PLANTING, HARVESTING, PROCESSING AND FERTILIZER AND WEED CONTROL EQUIPMENT. HAVE STUDENTS SELECT THE SIZE OF THE FARM POWER EQUIPMENT NEEDED TO SATISFACTORILY OPERATE EACH PIECE OF EQUIPMENT.

2. DEVELOP A MATCHING TEST, ONE LIST BEING THE ACCESSORIES FOR FARM POWER EQUIPMENT, THE OTHER SELECTED FIELD MACHINERY. HAVE STUDENTS COMPLETE BY MATCHING THE ITEMS AS TO USE.

3. PRESENT STUDENTS WITH A PROBLEM INVOLVING VARIOUS FIELD MACHINERY OPERATIONS, INCLUDING OVERALL SIZE OF THE OPERATION. HAVE STUDENTS SELECT THE FUEL TYPE TRACTOR THEY WOULD SELECT FOR USE FOR THE VARIOUS OPERATIONS.

4. HAVE STUDENTS DEVELOP A LIST OF THE QUALIFICATIONS THEY WOULD REQUIRE OF THE DEALER FROM WHOM THEY WOULD BUY THEIR FARM POWER EQUIPMENT. HAVE THEM RANK THE QUALIFICATIONS IN ORDER OF THEIR IMPORTANCE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CHARTS SHOWING HOURS REQUIRED TO PERFORM FIELD MACHINERY OPERATIONS ACCORDING TO THE SIZE OF THE MACHINE.

2. OPERATOR'S MANUALS OF FARM POWER EQUIPMENT

3. CHARTS SHOWING FUEL CONSUMPTION OF DIESEL AND GASOLINE FUEL TYPE FARM POWER EQUIPMENT.

F. EXAMPLES OF SUPPORTING REFERENCES

1. COOPERATIVE EXTENSION SERVICE

   THE COOPERATIVE EXTENSION SERVICE IN MANY STATES HAS BULLETINS AND REFERENCE MATERIALS WHICH COVER MANY OF THE INSTRUCTIONAL AREAS OF THIS UNIT.

2. HUNT, DONNELL. FARM POWER AND MACHINERY MANAGEMENT. AMES, IOWA: IOWA STATE UNIVERSITY PRESS. 1967, 294 PAGES.

   THIS LABORATORY MANUAL AND WORKBOOK WOULD SERVE AS A GOOD TEACHER'S REFERENCE AND COVERS INFORMATION DEALING WITH ECONOMIC PERFORMANCE, SELECTION, OPERATION, AND COST COMPARISONS OF MOST TYPES OF FARM MACHINERY.

SIMPLE MAINTENANCE AND REPAIR OF FARM POWER EQUIPMENT

UNIT CONCEPT: THE OWNER OR OPERATOR OF FARM POWER EQUIPMENT SHOULD BE ABLE TO PERFORM SIMPLE MAINTENANCE AND REPAIR JOBS TO PROVIDE FOR EFFICIENT AND ECONOMIC USE OF THE EQUIPMENT. OWNERS OR OPERATORS OF FARM POWER EQUIPMENT SHOULD BE ABLE TO MAKE DECISIONS REGARDING THOSE MAINTENANCE AND REPAIR JOBS THAT ARE BEYOND THEIR ABILITY TO PERFORM, AND SELECT A LOCATION WHERE THESE JOBS WILL BE PERFORMED ECONOMICALLY AND EFFICIENTLY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE PROBLEM OF PROVIDING ADEQUATE LUBRICATION FOR FARM POWER EQUIPMENT, DETERMINE THE KINDS OF LUBRICATION MATERIALS MOST SUITABLE TO USE AND THE FREQUENCY WITH WHICH THE VARIOUS LUBRICATION JOBS SHOULD BE DONE, ACCORDING TO SPECIFICATIONS AS PROVIDED IN THE FARM POWER EQUIPMENT OPERATOR'S MANUAL.

2. WHEN GIVEN THE PROBLEM OF SERVICING THE IGNITION SYSTEM OF GASOLINE OR LP-GAS FUEL TYPE FARM POWER EQUIPMENT, CARRY OUT RECOMMENDED PROCEDURES IN MAKING THE NEEDED ADJUSTMENTS, TESTING AND CLEANING THE VARIOUS COMPONENTS OF THE IGNITION SYSTEM ACCORDING TO SPECIFICATIONS OF THE MANUFACTURER OF THE EQUIPMENT AND SERVICE EQUIPMENT TECHNICIANS.

3. WHEN GIVEN THE PROBLEM OF SERVICING THE COOLING SYSTEMS OF FARM POWER EQUIPMENT, DEMONSTRATE THE PROCEDURES FOR CLEANING AND THE SELECTION OF SUITABLE COOLANT AND ANTIFREEZE MATERIALS ACCORDING TO RECOMMENDATIONS AS PROVIDED IN THE OPERATOR'S MANUAL.

4. WHEN GIVEN THE PROBLEM OF SERVICING AND ADJUSTING THE CARBURETION SYSTEM OF GASOLINE AND LP-GAS FUEL TYPE POWER EQUIPMENT, DETERMINE THE CORRECT PROCEDURES TO FOLLOW ACCORDING TO SPECIFICATIONS OF THE EQUIPMENT MANUFACTURER.

5. WHEN GIVEN THE PROBLEM OF MAKING MINOR REPAIRS OR REPLACEMENT OF PARTS ON THE IGNITION, COOLING, FUEL, LUBRICATION OR OTHER SYSTEM OF FARM POWER EQUIPMENT, DETERMINE PROCEDURES TO FOLLOW, AND SELECT THE MOST SUITABLE REPAIR OR REPLACEMENT MATERIALS, ACCORDING TO RECOMMENDATIONS AS PROVIDED IN THE OPERATOR'S MANUAL AND SERVICE MANUAL.

6. WHEN GIVEN FARM POWER EQUIPMENT NEEDING HYDRUALIC SYSTEM SERVICE AND ADJUSTMENT, DETERMINE THE PROCEDURES TO FOLLOW ACCORDING TO RECOMMENDATIONS OF THE MANUFACTURER OF THE EQUIPMENT AND EQUIPMENT SERVICE TECHNICIANS.

7. WHEN GIVEN THE PROBLEM OF SERVICING AND ADJUSTING THE FUEL INJECTION SYSTEM OF DIESEL FUEL TYPE FARM POWER EQUIPMENT, DETERMINE THE CORRECT PROCEDURES TO FOLLOW ACCORDING TO SPECIFICATIONS AS PROVIDED IN THE FARM POWER EQUIPMENT OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. DETERMINING KINDS AND TYPES OF LUBRICATING OILS AND THEIR SPECIFIC USE SITUATIONS

2. DETERMINING KINDS AND TYPES OF LUBRICATING GREASES AND THEIR SPECIFIC USE SITUATIONS

3. DETERMINING THE FREQUENCY WITH WHICH VARIOUS LUBRICATING JOBS SHOULD BE DONE

    A. FREQUENCY OF OIL CHANGES BASED ON SPECIFIC USE SITUATIONS

    B. FREQUENCY OF GREASE JOBS

        (1) GENERAL LUBRICATION
        (2) SPECIFIC JOBS - WHEEL BEARINGS

    C. REPLACING THE OIL FILTER

4. DETERMINING TYPES OF IGNITION SYSTEMS, THE FUNCTION OF EACH SEGMENT OF IGNITION SYSTEMS, THE SERVICES AND ADJUSTMENTS THAT SHOULD BE USED

    A. SERVICING AND CLEANING THE BATTERY AND TERMINALS

    B. SERVICING AND ALTERNATOR OR GENERATOR AND VOLTAGE REGULATOR

    C. CLEANING OR REPLACING SPARK PLUGS

    D. TESTING THE COIL

    E. TESTING THE PARTS OF THE DISTRIBUTOR

        (1) IGNITION POINTS
        (2) CONDENSER
        (3) DISTRIBUTOR CAP
        (4) ROTOR

- F. SERVICING THE ELECTRIC STARTER
- G. TIMING THE IGNITION SYSTEM

5. SERVICING THE COOLING SYSTEM
    - A. FLUSHING THE RADIATOR
    - B. CLEANING THE RADIATOR AIR GRIDS
    - C. SELECTING COOLANT AND ANTIFREEZE
6. SERVICING THE CARBURETOR
    - A. CLEANING THE CARBURETOR
    - B. REPLACING FUEL FILTERS
    - C. REPLACING AIR FILTERS
7. ADJUSTING THE CARBURETOR
    - A. ADJUSTING THE IDLE CONTROL
    - B. ADJUSTING THE HIGH SPEED CONTROL
8. SERVICING AND ADJUSTING THE FUEL INJECTION SYSTEMS OF DIESEL TYPE FARM POWER EQUIPMENT
    - A. SERVICING FUEL FILTER SYSTEMS
        - (1) CLEANING
        - (2) REPLACING
    - B. SERVICING INJECTION PUMPS
        - (1) CLEANING
        - (2) TESTING AND ADJUSTING
        - (3) TIMING
    - C. SERVICING INJECTION NOZZLES
        - (1) CLEANING
        - (2) TESTING
9. MAKING REPAIRS OR REPLACING WORN OR DAMAGED PARTS
    - A. REPLACING RADIATOR HOSES
    - B. REPLACING RADIATOR CAP
    - C. REPLACING DAMAGED OR WORN NEEDLE VALVE CONTROLS OF THE CARBURETOR

D. REPLACING WORN LINKAGE CONTROLS OF THE CARBURETION SYSTEM

E. REPLACING SPARK PLUGS

(1) SELECTING THE CORRECT TYPE OF SPARK PLUG
(2) ADJUSTING ELECTRODE GAP

F. REPLACING IGNITION POINTS AND CONDENSERS

(1) SELECTING CORRECT REPLACEMENT PARTS
(2) ADJUSTING IGNITION POINT GAP

G. SELECTING AND REPLACEMENT OF WORN BEARINGS

10. TESTING FOR ENGINE PERFORMANCE

A. MAKING COMPRESSION TESTS

B. ADJUSTING VALVE TAPPETS

11. SERVICING AND ADJUSTING THE POWER LIFT SYSTEM

A. CHECKING THE VALVE CONTROLS

(1) REPLACING WORN OR LEAKING CONTROLS
(2) ADJUSTING CONTROLS

B. CHECKING FLUID LEVEL

C. REPLACING FLUID

D. ADJUSTING CONTROL MECHANISMS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. PROVIDE STUDENTS WITH AN OPERATOR'S MANUAL OR A LUBRICATION GUIDE FOR SPECIFIC PIECES OF FARM POWER EQUIPMENT. HAVE STUDENTS PRACTICE LUBRICATING FARM POWER EQUIPMENT.

B. PROVIDE STUDENTS WITH SEVERAL SAMPLES OF ENGINE OIL WITH DESCRIPTIONS OF EACH AS TO THEIR SPECIFIC USES. HAVE STUDENTS SELECT THE TYPE OF OIL MOST SUITABLE FOR SPECIFIC PIECES OF FARM POWER EQUIPMENT BASED ON THE PLANNED USE OR USES UNDER WHICH THE EQUIPMENT WILL BE OPERATED.

C. AFTER EXAMINING THE OPERATOR'S MANUAL OR LUBRICATION GUIDE, HAVE STUDENTS DETERMINE WHEN THE OIL FILTER SHOULD BE REPLACED, AND SELECT THE TYPE OF FILTER REPLACEMENT THAT SHOULD BE MADE.

2. A. THROUGH THE USE OF CHARTS OR MODELS OF IGNITION SYSTEMS, DEMONSTRATE TO STUDENTS THE FUNCTIONS OF THE VARIOUS COMPONENTS OF THE IGNITION SYSTEM AND FROM SUITABLE REFERENCES HAVE STUDENTS DETERMINE THE FUNCTIONS OF EACH.

   B. HAVE STUDENTS PRACTICE CLEANING A CORRODED BATTERY AND SUPPLYING SUITABLE BATTERY WATER AT THE CORRECT LEVEL, AND TEST THE BATTERY CELLS USING A HYDROMETER.

   C. HAVE STUDENTS PRACTICE ADJUSTING IGNITION POINTS, CLEAN SPARK PLUGS, AND CHECK THE TIMING OF AN IGNITION SYSTEM.

   D. USING SUITABLE TESTING EQUIPMENT, HAVE STUDENTS TEST COILS AND CONDENSER TO DETERMINE THEIR SUITABILITY FOR CONTINUED USE.

3. A. HAVE STUDENTS PRACTICE CLEANING AND FLUSHING THE RADIATORS OF FARM POWER EQUIPMENT USING THE APPROPRIATE CLEANSING MATERIALS AND FLUSHING THE RADIATOR ACCORDING TO APPROVED SPECIFICATIONS.

   B. PROVIDE STUDENTS WITH COOLANT AND ANTIFREEZE MATERIALS AND HAVE THEM DETERMINE THE AMOUNT THAT SHOULD BE USED FOR A SPECIFIC COOLING SYSTEM AND SPECIFIC MAXIMUM AND MINIMUM TEMPERATURES.

4. A. PROVIDE STUDENTS WITH REFERENCES OF FUEL SYSTEMS FOR FARM POWER EQUIPMENT AND HAVE THEM DIAGRAM THE FUEL AND AIR FLOW THROUGH THE SYSTEM AND LABEL THE FUNCTION OR FUNCTIONS OF EACH COMPONENT OF THE SYSTEM.

   B. HAVE STUDENTS PRACTICE MAKING ADJUSTMENTS OF THE IDLE AND HIGH SPEED ADJUSTING CONTROLS.

   C. USING THE OPERATOR'S MANUAL, HAVE STUDENTS SELECT THE KIND OF FILTERS TO REPLACE AND THE FREQUENCY OF REPLACEMENT FOR SPECIFIC USE SITUATIONS OF FARM POWER EQUIPMENT.

5. A. HAVE STUDENTS PREPARE A REPAIR AND REPLACEMENT INFORMATION CHART LISTING IN ONE COLUMN THE REPAIRS OR REPLACEMENT OF THEIR CAPABILITIES. IN A SECOND COLUMN, HAVE THEM LIST THE TOOLS REQUIRED AND IN A THIRD COLUMN, LIST THE PROCEDURES TO FOLLOW.

   B. HAVE STUDENTS PRACTICE MAKING MINOR REPAIRS OR REPLACEMENTS SUCH AS IGNITION POINTS, RADIATOR HOSES, AND DAMAGED PARTS OF A MINOR NATURE.

6. A. PROVIDE STUDENTS WITH OPERATOR'S MANUALS SHOWING THE COMPONENTS AND FUNCTIONS OF THE POWER LIFT SYSTEMS. HAVE EACH STUDENT DIAGRAM THE POWER LIFT SYSTEM FOR THEIR FARM POWER EQUIPMENT.

   B. HAVE EACH STUDENT PRACTICE MAKING ADJUSTMENTS AND SERVICING A HYDRAULIC SYSTEM OF FARM POWER EQUIPMENT.

7. HAVE A QUALIFIED SERVICE TECHNICIAN DEMONSTRATE TO STUDENTS THE PROCEDURES FOR SERVICING THE FUEL INJECTION SYSTEM OF DIESEL FARM POWER EQUIPMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. EXHIBIT FOR STUDENT OBSERVATION THE VARIOUS KINDS OF LUBRICANTS (OILS AND GREASES) AND OIL FILTERS WITH APPROPRIATE DESCRIPTIONS OF EACH ITEM. HAVE STUDENTS IDENTIFY EACH ITEM AS TO CONDITIONS WHERE EACH SHOULD BE USED.

   B. HAVE EACH STUDENT DEMONSTRATE THE CORRECT PROCEDURE FOR PACKING WHEEL BEARINGS, CHANGING TRANSMISSION FLUID AND ENGINE OIL AND REPLACING AN OIL FILTER.

2. A. HAVE EACH STUDENT PREPARE A DIAGRAM OF THE IGNITION SYSTEM USED ON FARM POWER EQUIPMENT. LABEL AND DESCRIBE THE FUNCTION OF EACH COMPONENT OF THE SYSTEM CORRECTLY.

   B. HAVE EACH STUDENT DEMONSTRATE THE CORRECT PROCEDURE FOR TIMING THE IGNITION SYSTEM OF FARM POWER EQUIPMENT.

   C. HAVE EACH STUDENT DEMONSTRATE THE CORRECT PROCEDURE FOR TESTING THE EFFICIENCY OF THE COIL AND CONDENSER.

   D. HAVE EACH STUDENT DEMONSTRATE THE CORRECT PROCEDURE FOR TESTING THE CELLS OF A BATTERY AND CLEANING THE TERMINALS.

3. PROVIDE STUDENTS WITH INFORMATION REGARDING A COOLING SYSTEM IN NEED OF SERVICING. HAVE THEM DESCRIBE PROCEDURES FOR CLEANING AND THE AMOUNT OF A SPECIFIC COOLANT/ANTIFREEZE THAT SHOULD BE USED FOR A SPECIFIC MINIMUM TEMPERATURE.

4. A. PROVIDE STUDENTS WITH A MALFUNCTIONING ENGINE DUE TO CARBURETOR ADJUSTMENTS. HAVE STUDENTS DEMONSTRATE THEIR ABILITY TO MAKE THE NEEDED ADJUSTMENTS.

   B. PROVIDE STUDENTS WITH A DESCRIPTION OF DIFFERENT OPERATING CONDITIONS FOR FARM POWER EQUIPMENT AND HAVE THEM LIST THE FREQUENCY THAT THE AIR FILTER SHOULD BE CHANGED FOR EACH CONDITION.

5. HAVE STUDENTS DEMONSTRATE THEIR ABILITY TO REPLACE SPARK PLUGS, IGNITION POINTS, RADIATOR HOSES AND OTHER MINOR REPLACEMENTS OR REPAIRS ON FARM POWER EQUIPMENT, MAKING ALL ADJUSTMENTS SPECIFICALLY AND ACCURATELY.

6. HAVE STUDENTS DIAGRAM THE HYDRAULIC SYSTEM OF A FARM POWER EQUIPMENT UNIT LABELING ALL COMPONENTS AND DESCRIBING THE FUNCTION OF EACH COMPONENT.

7. HAVE STUDENTS DIAGRAM THE FUEL INJECTION SYSTEM OF DIESEL FARM POWER EQUIPMENT AND LABEL THE PARTS AND LIST THE AREAS NEEDING SERVICE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATORS' MANUALS OF FARM POWER EQUIPMENT

2. SAMPLES OF LUBRICATING MATERIALS - OIL AND GREASE

3. SAMPLES OF ANTIFREEZE/COOLANT MATERIALS

4. LUBRICATION CHARTS

5. CHARTS, SLIDES, PICTURES OR MODELS OF IGNITION, CARBURETION AND FUEL INJECTION SYSTEMS OF FARM POWER EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. FARM TRACTOR TUNE-UP. VAS 3008. URBANA, ILLINOIS: VOCATIONAL AGRICULTURAL SERVICE, UNIVERSITY OF ILLINOIS. 12 PAGES.

   GIVES SPECIFIC INFORMATION ON SERVICING GASOLINE FUEL TYPE FARM POWER EQUIPMENT.

2. FUNDAMENTALS OF SERVICE - ENGINES. MOLINE, ILLINOIS: JOHN DEERE SERVICE PUBLICATION. 1968, 286 PAGES.

   THIS MANUAL GIVES DETAILED INFORMATION ON SERVICING AND MAKING MINOR REPAIRS ON GASOLINE, LP-GAS AND DIESEL FUEL TYPE FARM POWER EQUIPMENT.

3. TRACTOR MAINTENANCE PRINCIPLES AND PROCEDURES. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION OF VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, 147 PAGES.

   PROVIDES SPECIFIC INFORMATION FOR SERVICING FARM POWER EQUIPMENT.

PREPARING FARM POWER EQUIPMENT FOR STORAGE

UNIT CONCEPT: THE PROPER PREPARATION OF FARM POWER EQUIPMENT FOR STORAGE WILL INCREASE THE USEFUL LIFE OF THE EQUIPMENT AND PROVIDE FOR MORE EFFICIENT FUTURE USE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED FARM POWER EQUIPMENT TO BE STORED, DETERMINE THOSE COMPONENTS OF THE SYSTEM THAT SHOULD BE PROTECTED WHILE IN STORAGE AND SELECT AND USE PROCEDURES FOR PROTECTION, ACCORDING TO RECOMMENDATIONS OF EQUIPMENT MANUFACTURERS.

B. INSTRUCTIONAL AREAS

1. DETERMINING COMPONENTS NEEDING PROTECTION WHILE IN STORAGE
   - A. DETERMINING POSSIBLE DETERIORATION OF TIRES WHILE IN STORAGE
   - B. DETERMINING POSSIBLE BATTERY DAMAGE WHILE IN STORAGE
   - C. DETERMINING POSSIBLE DAMAGE TO CARBURETOR AND OTHER COMPONENTS OF THE FUEL SYSTEM WHILE IN STORAGE
   - D. DETERMINING POSSIBLE DAMAGE TO PISTONS AND VALVES WHILE IN STORAGE
2. PROVIDING PROTECTION FOR VARIOUS COMPONENTS OF FARM POWER EQUIPMENT DURING STORAGE
   - A. EXECUTING PROTECTION PROCEDURES FOR TIRES
   - B. PERFORMING NECESSARY BATTERY PROTECTION PROCEDURES
   - C. DETERMINING AND CARRYING OUT PROCEDURES FOR FUEL REMOVAL FROM FUEL SYSTEM
   - D. SELECTING PROCEDURES FOR PROTECTION OF PISTONS AND VALVES DURING STORAGE

3. PROTECTING THE HYDRAULIC SYSTEM DURING STORAGE

4. PROTECTING THE COOLING SYSTEM WHILE IN STORAGE

5. PROTECTING THE TRANSMISSION AND CLUTCH WHILE IN STORAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS VISIT A SERVICE CENTER FOR FARM POWER EQUIPMENT OR HAVE THE MANAGER OF SUCH A CENTER VISIT THE CLASSROOM AND DISCUSS WITH THE STUDENTS THE PROPER STORAGE PROCEDURES FOR FARM POWER EQUIPMENT.

   B. PROVIDE STUDENTS WITH OPERATOR'S MANUALS AND OTHER REFERENCES THAT DESCRIBE PROCEDURES FOR CORRECTLY STORING FARM POWER EQUIPMENT. HAVE EACH STUDENT PREPARE AN INFORMATION CHART, ONE COLUMN BEING THE COMPONENTS NEEDING PREPARATION FOR STORAGE, THE SECOND COLUMN DESCRIPTIONS OF PROCEDURES FOR PREPARATION FOR STORAGE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST WITH ONE COLUMN BEING THE COMPONENTS OF FARM POWER EQUIPMENT NEEDING PREPARATION FOR STORAGE, AND THE SECOND COLUMN BEING DESCRIPTIONS OF PROCEDURES FOR STORAGE PREPARATION. HAVE STUDENTS ARRANGE FOR CORRECTNESS.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR'S MANUALS OF FARM POWER EQUIPMENT

F. EXAMPLES OF SUPPORTING.REFERENCES

1. TRACTOR MAINTENANCE - PRINCIPLES AND PROCEDURES. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, PP. 145-147.

   PROVIDES A LIST OF THE VARIOUS COMPONENTS OF FARM POWER EQUIPMENT AND PROCEDURES FOR PREPARING EACH COMPONENT FOR STORAGE.

SELECTION, OPERATION AND MAINTENANCE OF TILLAGE MACHINERY

UNIT CONCEPT: THE PROPER SELECTION, OPERATION AND MAINTENANCE OF TILLAGE MACHINERY BY THE OPERATOR WILL RESULT IN A SATISFACTORY SEED BED FOR GOOD SEED GERMINATION AND/OR GOOD WEED CONTROL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION CONCERNING THE SIZE AND TYPE OF FARM OPERATION, THE TYPE OF SOIL, EQUIPMENT, MANPOWER AND MONEY AVAILABLE, SELECT THE TILLAGE MACHINERY NEEDED FOR THE DESIRED TYPE OF TILLAGE TO PREPARE A SATISFACTORY SEED BED FOR GOOD SEED GERMINATION AND/OR CONTROL OF WEEDS TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN PROVIDED WITH VARIOUS TYPES OF TILLAGE MACHINERY, OPERATE THE MACHINERY IN A SAFE MANNER AND PREPARE A SATISFACTORY SEED BED FOR GOOD SEED GERMINATION AND/OR CONTROL OF WEEDS AS RECOMMENDED BY THE OPERATOR'S MANUAL.

3. WHEN GIVEN VARIOUS TYPES OF TILLAGE MACHINERY THAT HAVE BEEN IN OPERATION IN THE FIELD, PERFORM THE NECESSARY MAINTENANCE TO INSURE THEIR PROPER OPERATION AS RECOMMENDED BY THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. SELECTING TILLAGE EQUIPMENT
   - A. PURPOSE OF VARIOUS TYPES OF TILLAGE MACHINERY
   - B. IDENTIFYING THE PARTS AND FUNCTIONS OF VARIOUS TYPES OF MACHINERY FOR TILLAGE
   - C. DETERMINING THE TYPE OF TILLAGE OPERATION TO USE
     - (1) IDENTIFYING THE SOIL TYPE AND TOPOGRAPHY
     - (2) DETERMINING THE AMOUNT OF LAND TO BE WORKED AND THE TIME LIMITATIONS

(3) IDENTIFYING THE FARMING PROGRAM FOLLOWED
(4) IDENTIFYING THE POWER UNITS AVAILABLE
(5) DETERMINING THE FINANCIAL RESOURCES AVAILABLE, COST OF MACHINERY, AND RETURNS EXPECTED
(6) IDENTIFYING THE MACHINERY SUPPLIER AND SERVICE AVAILABLE
(7) SELECTING THE DESIGN, EASE OF OPERATION AND ADJUSTMENT, AND MANEUVERABILITY

2. OPERATING TILLAGE MACHINERY

A. USING THE OPERATOR'S MANUAL FOR PROPER TILLAGE MACHINERY OPERATION

B. OBSERVING SAFETY PRECUATIONS

C. MATCHING THE POWER UNIT WITH THE TILLAGE MACHINERY

D. HITCHING THE TRACTOR AND ADJUSTING MACHINERY

E. OBSERVING THE RECOMMENDED OPERATING SPEED

3. MAINTAINING TILLAGE MACHINERY

A. USING THE OPERAOTR'S MANUAL FOR EQUIPMENT MAINTENANCE

B. ALIGNING MACHINERY

C. LUBRICATING MACHINERY

D. CHECKING FOR WORN AND LOOSE PARTS

E. PREPARING MACHINERY FOR STORAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. COLLECT ADVERTISING BULLETINS OF VARIOUS TYPES OF TILLAGE MACHINERY. DETERMINE THE AVAILABLE MACHINERY SIZES, POWER UNITS REQUIRED, TYPE OF SOIL CONDITIONS FOR WHICH IT WAS DESIGNED, AND COST.

B. ASK STUDENTS TO BRING TO CLASS THEIR OPERATOR MANUALS WHICH ARE FOR VARIOUS TYPES OF TILLAGE MACHINERY. DETERMINE WHICH TYPES OF EQUIPMENT ARE MOST EASILY MAINTAINED.

2. A. HOLD A PLOWING CONTEST ON THE SCHOOL LAND LABORATORY TO DETERMINE STUDENT'S KNOWLEDGE OF PLOW AND TILLAGE OPERATION AND PROVIDE A LEARNING EXPERIENCE FOR STUDENTS IN THIS EQUIPMENT OPERATION.

B. VISIT A FARM MACHINERY SHOW TO ALLOW STUDENTS TO VIEW THE OPERATION OF VARIOUS TYPES OF TILLAGE MACHINERY.

3. IDENTIFY THE NUMBER AND LOCATION OF GREASE FITTINGS ON VARIOUS TYPES OF TILLAGE EQUIPMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST THE FACTORS TO CONSIDER WHEN SELECTING TILLAGE MACHINERY AND EQUIPMENT. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) SOIL TYPE, (2) AMOUNT OF LAND TO BE TILLED, (3) TYPE OF FARMING PROGRAM, (4) CONDITION OF AVAILABLE EQUIPMENT, (5) COST OF PURCHASE, AND (6) AVAILABILITY OF SERVICE CENTERS.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO OPERATE TILLAGE EQUIPMENT. EVALUATION SHOULD BE BASED UPON STUDENTS ADHERANCE TO SAFE OPERATING PROCEDURES.

3. HAVE EACH STUDENT LUBRICATE, SERVICE, MAKE MINOR REPAIRS, AND ADJUST A SPECIFIC PIECE OF TILLAGE EQUIPMENT ACCORDING TO THE SPECIFICATIONS IN THE SERVICE MANUAL AND/OR TO THE SATISFACTION OF THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR MANUALS AND ADVERTISING BULLETINS FOR VARIOUS TYPES OF TILLAGE MACHINERY.

2. VARIOUS TYPES OF TILLAGE MACHINERY WHICH CAN BE USED TO DEMONSTRATE THEIR PROPER OPERATION.

3. APPROPRIATE HAND AND POWER TOOLS NEEDED TO ADJUST AND SERVICE TILLAGE MACHINERY.

F. EXAMPLES OF SUPPORTING REFERENCES

1. OPERATOR MANUALS FOR THE EQUIPMENT BEING CONSIDERED.

2. PLOWS AND PLOWING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1969.

   INCLUDES MATERIAL ON SELECTION, OPERATION, ADJUSTMENT, AND MAINTENANCE OF TILLAGE EQUIPMENT.

3. TILLAGE SYSTEMS FOR CORN (SLIDE SERIES). COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972.

A SET OF SLIDES WHICH COVERS VARIOUS TYPES OF TILLAGE EQUIPMENT.

SELECTION, OPERATION AND MAINTENANCE OF FERTILIZER, WEED, INSECT AND DISEASE CONTROL MACHINERY

UNIT CONCEPT: THE PROPER SELECTION, OPERATION AND MAINTENANCE OF FERTILIZER APPLICATION, WEED, INSECT AND/OR DISEASE CONTROL MACHINERY BY THE OPERATOR WILL PROVIDE THE MEANS OF SUPPLYING THE DESIRED AMOUNT OF FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION CONCERNING THE SIZE AND TYPE OF FARM OPERATION, THE TYPE OF SOIL, EQUIPMENT, MANPOWER, AND MONEY AVAILABLE, SELECT THE FERTILIZER, WEED, INSECT, AND/OR DISEASE CONTROL MACHINERY NEEDED TO MAXIMIZE CROP PRODUCTION.

2. WHEN PROVIDED WITH MACHINERY FOR FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL, OPERATE SUCH MACHINERY IN A SAFE MANNER AND PROVIDE THE DESIRED FERTILIZER APPLICATION, WEED, INSECT, AND/OR DISEASE CONTROL AS RECOMMENDED IN THE OPERATOR'S MANUAL.

3. WHEN GIVEN MACHINERY FOR FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL, PERFORM THE NECESSARY MAINTENANCE TO INSURE THEIR PROPER OPERATION AS RECOMMENDED IN THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. SELECTING MACHINERY FOR FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL

    A. PURPOSE OF VARIOUS TYPES OF MACHINERY FOR FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL

    B. IDENTIFYING THE PARTS AND FUNCTIONS OF VARIOUS TYPES OF MACHINERY FOR FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL

    C. IDENTIFYING THE FARMING PROGRAM FOLLOWED

D. DETERMINING THE AMOUNT OF LAND TO BE HARVESTED AND THE TIME LIMITATIONS TO CONSIDER

E. DETERMINING THE FINANCIAL RESOURCES AVAILABLE, THE EQUIPMENT COSTS, AND THE RETURNS EXPECTED

F. IDENTIFYING THE MACHINERY SUPPLIER AND SERVICE AVAILABLE

2. OPERATING MACHINERY FOR FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL

A. USING THE OPERATORS MANUAL FOR DETERMINING PROPER EQUIPMENT OPERATION

B. OBSERVING SAFETY PRECAUTIONS

C. CALIBRATING AND ADJUSTING THE MACHINERY

D. OBSERVING THE RECOMMENDED OPERATING SPEED

E. HITCHING AND LUBRICATING THE MACHINERY

3. MAINTAINING MACHINERY FOR FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL

A. USING THE OPERATOR'S MANUAL FOR EQUIPMENT MAINTENANCE

B. LUBRICATING MACHINERY

C. CHECKING FOR WORN AND LOOSE PARTS

D. PREPARING MACHINERY FOR STORAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. COLLECT ADVERTISING BULLETINS OF VARIOUS TYPES OF FERTILIZATION, WEED, AND/OR INSECT DISEASE CONTROL MACHINERY. DETERMINE THE AVAILABLE MACHINERY SIZES, USE FOR WHICH IT WAS DESIGNED, AND COST.

2. A. ASK STUDENTS TO BRING TO CLASS THEIR OPERATOR MANUALS WHICH ARE FOR VARIOUS TYPES OF FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL MACHINERY. DETERMINE THE BEST WAY TO CALIBRATE EACH MACHINE.

B. CALIBRATE A SPRAYER TO SUPPLY A GIVEN AMOUNT OF MATERIAL AT A GIVEN SPEED.

3. PERFORM THE NECESSARY MAINTENANCE REQUIRED BY VARIOUS TYPES OF FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL MACHINERY.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS COMPARE THE ADVANTAGES AND DISADVANTAGES OF EQUIPMENT USED FOR APPLYING FERTILIZER IN DRY (GRANULAR) FORM AND LIQUID FORMS. LEVEL OF PERFORMANCE SHOULD BE TO THE SATISFACTION OF THE INSTRUCTOR.

2. HAVE EACH STUDENT LIST THE SAFETY PRECAUTIONS TO OBSERVE WHEN OPERATING CHEMICAL SPRAY EQUIPMENT. EVALUATION SHOULD BE BASED UPON SPECIFICATION AND RECOMMENDATIONS OF THE EQUIPMENT MANUFACTURER AND THE LABEL DIRECTIONS FOR THE PARTICULAR CHEMICAL(S) BEING APPLIED.

3. EACH STUDENT SHOULD DEMONSTRATE THE CORRECT PROCEDURES FOR CLEANING AND PREPARING FERTILIZER, WEED, INSECT, OR DISEASE CONTROL EQUIPMENT FOR STORAGE ACCORDING TO SPECIFICATIONS IN THE OPERATOR'S MANUAL.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR MANUALS AND ADVERTISING BULLETINS FOR VARIOUS TYPES OF FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL MACHINERY.

2. TYPES OF FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL MACHINERY TYPICAL IN FARMING COMMUNITIES WHICH STUDENTS CAN CALIBRATE AND PERFORM BASIC MAINTENANCE REQUIREMENTS.

3. APPROPRIATE HAND AND POWER TOOLS NEEDED TO ADJUST AND SERVICE FERTILIZATION, WEED, INSECT, AND/OR DISEASE CONTROL MACHINERY.

F. EXAMPLES OF SUPPORTING REFERENCES

1. FARM MACHINERY AND EQUIPMENT. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1964, PP. 209-287.

   CHAPTER CONTAINS MATERIAL ON OPERATION, ADJUSTMENT, AND MAINTENANCE OF SPREADERS AND SPRAYERS. WOULD SERVE AS A GOOD TEACHER REFERENCE.

2. INSECTICIDES - KINDS, FORMULATIONS, MIXING, AND APPLYING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1973.

   COMPREHENSIVE COVERAGE OF SELECTING MIXING AND APPLYING INSECTICIDES TO FARM CROPS. MATERIAL IS EASILY UNDERSTOOD BY STUDENTS.

3. OPERATOR'S MANUALS FOR THE MACHINERY BEING CONSIDERED.

4. WEED CONTROL, CULTURAL AND CHEMICAL. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1969.

   COVERS MANY ASPECTS OF WEED CONTROL PROCESSES AND PROCEDURES INCLUDING MACHINERY OPERATION.

SELECTION, OPERATION AND MAINTENANCE OF PLANTING EQUIPMENT

UNIT CONCEPT: THE PROPER SELECTION, OPERATION AND MAINTENANCE OF PLANTING EQUIPMENT BY THE OPERATOR WILL AID IN PROVIDING THE DESIRED GERMINATION AND CROP GROWTH.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. PROVIDED WITH INFORMATION CONCERNING THE SIZE AND TYPE OF FARM OPERATION, AND THE EQUIPMENT, MANPOWER AND MONEY AVAILABLE, SELECT THE PLANTING EQUIPMENT NEEDED TO PROVIDE EFFICIENT AS WELL AS ECONOMICAL PLANTING.

2. PROVIDED WITH EQUIPMENT FOR PLANTING, OPERATE THE PLANTER TO PROVIDE THE DESIRED RATE OF SEED OR PLANTS, FERTILIZER, AND HERBICIDES PER ACRE FOR THE DESIRED GERMINATION, STAND, AND WEED CONTROL AS RECOMMENDED BY THE OPERATOR'S MANUAL.

3. GIVEN EQUIPMENT FOR PLANTING, PERFORM THE NECESSARY MAINTENANCE TO INSURE ITS PROPER OPERATION AS RECOMMENDED IN THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. SELECTING EQUIPMENT FOR PLANTING

   A. PURPOSE OF VARIOUS TYPES OF MACHINERY FOR PLANTING CROPS

      (1) ROW-CROP PLANTERS
      (2) BROADCAST-CROP PLANTERS
      (3) GRAIN DRILLS
      (4) PLANTING ATTACHMENTS FOR OTHER EQUIPMENT

   B. IDENTIFYING THE PARTS AND FUNCTIONS OF VARIOUS TYPES OF MACHINERY FOR PLANTING CROPS

   C. IDENTIFYING THE FARMING PROGRAM FOLLOWED

   D. DETERMINING THE AMOUNT OF LAND TO BE PLANTED AND THE TIME LIMITATIONS TO CONSIDER

   E. DETERMINING THE FINANCIAL RESOURCES AVAILABLE, EQUIPMENT COSTS, AND RETURNS EXPECTED

   - F. IDENTIFYING THE MACHINERY SUPPLIER AND SERVICE AVAILABLE
   - G. SELECTING THE DESIGN, EASE OF OPERATION, ADJUSTMENT AND MANEUVERABILITY OF THE EQUIPMENT

2. OPERATING THE EQUIPMENT FOR PLANTING CROPS
   - A. USING THE OPERATOR'S MANUAL FOR DETERMINING PROPER EQUIPMENT OPERATION
   - B. OBSERVING SAFETY PRECAUTIONS
   - C. CALIBRATING AND ADJUSTING THE EQUIPMENT
   - D. OBSERVING THE RECOMMENDED OPERATING SPEED
   - E. CHECKING THE PLANTING RATE

3. MAINTAINING THE MACHINERY FOR PLANTING CROPS
   - A. USING THE OPERATOR'S MANUAL FOR EQUIPMENT
   - B. LUBRICATING AND ADJUSTING EQUIPMENT
   - C. CHECKING FOR WORN AND LOOSE PARTS
   - D. PREPARING EQUIPMENT FOR STORAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. COLLECT ADVERTISING BULLETINS OF VARIOUS TYPES OF PLANTING EQUIPMENT. DETERMINE THE AVAILABLE EQUIPMENT SIZES, USE FOR WHICH IT WAS DESIGNED, AND EQUIPMENT COST.

2. A. ASK STUDENTS TO BRING TO CLASS THEIR OPERATOR MANUALS FOR VARIOUS TYPES OF PLANTING EQUIPMENT. DETERMINE WHICH TYPES OF EQUIPMENT ARE MOST EASILY ADJUSTED AND MAINTAINED.

   B. CALIBRATE A PLANTER TO SUPPLY A GIVEN AMOUNT OF SEED AND FERTILIZER AT A GIVEN SPEED.

3. PERFORM THE NECESSARY MAINTENANCE REQUIRED BY VARIOUS TYPES OF PLANTER EQUIPMENT. THIS CAN INCLUDE LUBRICATION, CLEANING OR REPLACING SEED PLATES, AND OTHERS NOTED IN THE OPERATOR'S MANUAL.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS LIST THE FACTORS TO CONSIDER WHEN SELECTING PLANTING EQUIPMENT. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) TYPE OF CROP TO BE PLANTED, (2) AMOUNT OF PLANTING TO BE DONE, (3) CONDITION OF AVAILABLE MACHINERY, (4) AMOUNT OF EQUIPMENT USE PLANNED, AND (5) COST COMPARISONS OF MACHINERY.

2. GIVE EACH STUDENT A SPECIFIC PLANTING RATE FOR A CROP AND HAVE THEM CALIBRATE A PLANTER FOR THIS SEEDING RATE. THIS SHOULD BE ACCOMPLISHED WITH 95% ACCURACY.

3. EACH STUDENT SHOULD LUBRICATE, SERVICE, MAKE MINOR REPAIRS, AND ADJUST A SPECIFIC PIECE OF PLANTING EQUIPMENT ACCORDING TO THE SPECIFICATIONS OF THE SERVICE MANUALS AND/OR TO THE SATISFACTION OF THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR MANUALS AND ADVERTISING BULLETINS FOR VARIOUS TYPES OF PLANTING EQUIPMENT

2. VARIOUS TYPES OF PLANTING EQUIPMENT WHICH STUDENTS CAN CALIBRATE AND PERFORM BASIC MAINTENANCE REQUIREMENTS.

3. APPROPRIATE HAND AND POWER TOOLS NEEDED TO ADJUST AND SERVICE PLANTING EQUIPMENT.

F. EXAMPLES OF SUPPORTING REFERENCES

1. FARM MACHINERY AND EQUIPMENT. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1964, PP. 167-208.

   THIS SECTION INCLUDES MATERIAL ON OPERATION AND MAINTENANCE OF PLANTING EQUIPMENT. MAY NEED TO BE UP-DATED DUE TO PUBLICATION DATE OF 1964.

2. HUNT, DONNELL. FARM POWER AND MACHINERY MANAGEMENT. AMES, IOWA: IOWA STATE UNIVERSITY PRESS. 1967, 273 PAGES.

   A RATHER TECHNICAL REFERENCE WHICH WOULD BE HELPFUL TO THE TEACHER IN PLANNING THIS UNIT. MATERIAL COVERED INCLUDES SECTIONS ON ECONOMIC PERFORMANCE, COSTS, OPERATIONS, AND POWER EQUIPMENT SELECTION, ALSO INCLUDES LABORATORY EXERCISES.

3. OPERATORS' MANUALS FOR THE EQUIPMENT BEING CONSIDERED.

SELECTION, OPERATION AND MAINTENANCE OF HARVESTING EQUIPMENT

UNIT CONCEPT: THE PROPER SELECTION OF SIZE AND DETERMINATION OF OWNERSHIP, OPERATION, AND MAINTENANCE OF HARVEST EQUIPMENT BY THE OPERATOR WILL AID IN MINIMIZING LOSSES OF TIME AND HARVEST THAT MAY OCCUR.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION CONCERNING THE SIZE AND TYPE OF FARMING OPERATION, EQUIPMENT, MANPOWER, AND MONEY AVAILABLE, SELECT HARVESTING EQUIPMENT NEEDED FOR THE GIVEN OPERATION.

2. WHEN PROVIDED WITH EQUIPMENT FOR HARVESTING, OPERATE THE EQUIPMENT IN A WAY THAT IS SAFE AND WILL MINIMIZE CROP LOSSES AS RECOMMENDED IN THE OPERATOR'S MANUALS.

3. WHEN GIVEN HARVESTING EQUIPMENT, PERFORM THE NECESSARY MAINTENANCE TO INSURE ITS PROPER OPERATION AS RECOMMENDED IN THE OPERATOR'S MANUAL.

B. INSTRUCTIONAL AREAS

1. SELECTING HARVESTING EQUIPMENT

    A. PURPOSE OF VARIOUS TYPES OF MACHINERY FOR HARVESTING CROPS

        (1) GRAIN HARVESTING EQUIPMENT
        (2) HAY AND FORAGE HARVESTING EQUIPMENT
        (3) VEGETABLE AND FRUIT HARVESTERS
        (4) SPECIALTY CROP HARVESTERS

    B. IDENTIFYING THE PARTS AND FUNCTIONS OF VARIOUS TYPES OF MACHINERY FOR HARVESTING CROPS

    C. IDENTIFYING THE FARMING PROGRAM FOLLOWED

    D. DETERMINING THE AMOUNT OF LAND TO BE HARVESTED AND THE TIME LIMITATIONS TO CONSIDER

E. DETERMINING THE FINANCIAL RESOURCES AVAILABLE, THE EQUIPMENT COSTS, AND RETURNS EXPECTED

F. IDENTIFYING THE MACHINERY SUPPLIER AND SERVICE AVAILABLE

G. SELECTING THE DESIGN, EASE OF OPERATION AND ADJUSTMENT, MANEUVERABILITY AND COMFORT OF EQUIPMENT

2. OPERATING THE EQUIPMENT FOR HARVESTING CROPS

A. USING THE OPERATOR'S MANUAL FOR DETERMINING PROPER EQUIPMENT OPERATION

B. ATTACHING AND LUBRICATING HARVESTING EQUIPMENT

C. OBSERVING SAFETY PRECAUTIONS

D. CALIBRATING AND ADJUSTING THE EQUIPMENT

E. OBSERVING THE RECOMMENDED OPERATING SPEED

F. CHECKING FOR HARVEST LOSS OR PRODUCT DAMAGE

3. MAINTAINING THE EQUIPMENT FOR HARVESTING CROPS

A. USING THE OPERATOR'S MANUAL FOR EQUIPMENT MAINTENANCE

B. LUBRICATING AND ADJUSTING EQUIPMENT

C. CHECKING FOR WORN AND LOOSE PARTS

D. PREPARING EQUIPMENT FOR STORAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. COLLECT ADVERTISING BULLETINS OF VARIOUS TYPES OF PLANTING EQUIPMENT. DETERMINE THE AVAILABLE EQUIPMENT SIZES, USE FOR WHICH IT WAS DESIGNED AND EQUIPMENT COST.

2. A. ASK STUDENTS TO BRING TO CLASS THEIR OPERATOR'S MANUALS WHICH ARE FOR VARIOUS TYPES OF HAVESTING EQUIPMENT. DETERMINE WHICH TYPES OF EQUIPMENT REQUIRE THE LEAST AMOUNT OF MAINTENANCE.

B. CHECK THE HARVEST LOSS OF A MACHINE IN OPERATION AND ADJUST THE EQUIPMENT IF POSSIBLE TO CORRECT FOR LOSSES.

3. IDENTIFY THE NUMBER AND LOCATION OF GREASE FITTINGS ON VARIOUS TYPES OF HARVESTING EQUIPMENT

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS CORRECTLY MATCH PICTURES OR OTHER ILLUSTRATIONS OF VARIOUS TYPES OF HARVESTING EQUIPMENT WITH SPECIFIC CROPS TO BE HARVESTED.

2. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO FOLLOW SAFETY PRECAUTIONS WHEN OPERATING A SPECIFIC PIECE OF HARVESTING EQUIPMENT. IF MACHINERY IS NOT AVAILABLE, HAVE HIM DESCRIBE AND EXPLAIN THE IMPORTANCE OF THESE SAFETY CONSIDERATIONS WITH COMPLETE ACCURACY.

3. EACH STUDENT SHOULD LUBRICATE, SERVICE, MAKE MINOR REPAIRS, AND ADJUST AT LEAST TWO DIFFERENT KINDS OF HARVESTING EQUIPMENT ACCORDING TO THE SPECIFICATIONS OF THE SERVICE MANUALS WITH 100% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR MANUALS AND ADVERTISING BULLETINS FOR VARIOUS TYPES OF HARVESTING EQUIPMENT

2. VARIOUS TYPES OF HARVESTING EQUIPMENT

3. APPROPRIATE HAND AND POWER TOOLS NEEDED TO ADJUST AND SERVICE HARVESTING EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. COMBINES AND COMBINING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 105 PAGES.

   COMPREHENSIVE STUDENT OR TEACHER MANUAL WITH MATERIAL COVERING OPERATION, CARE AND MAINTENANCE OF COMBINES. EASILY UNDERSTOOD BY STUDENTS.

2. CORN PICKERS AND PICKING CORN. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 137 PAGES.

   MATERIAL COVERED INCLUDES PICKER DESIGN, OPERATION AND MAINTENANCE AND ECONOMICS OF PICKER OWNERSHIP.

3. FARM MACHINERY AND EQUIPMENT. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1964, PP. 289-410.

   THIS SECTION INCLUDES MATERIAL ON OPERATION AND MAINTENANCE OF VARIOUS TYPES OF HARVESTING MACHINERY. CONTENT MAY NEED TO BE UP-DATED DUE TO THE PUBLICATION DATE OF 1964.

4. FIELD MOWERS. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION OF VOCATIONAL INSTRUCTIONAL MATERIALS. 1966, 124 PAGES.

   A WELL-ILLUSTRATED REFERENCE WHICH INCLUDES MATERIAL ON SELECTING AND MAINTAINING VARIOUS TYPES OF FIELD MOWERS.

5. OPERATOR MANUALS FOR THE EQUIPMENT BEING CONSIDERED.

SELECTION, OPERATION AND MAINTENANCE OF PROCESSING AND HANDLING EQUIPMENT

UNIT CONCEPT: THE PROPER SELECTION, OPERATION AND MAINTENANCE OF PROCESSING AND HANDLING EQUIPMENT BY THE OPERATOR WILL RESULT IN EFFICIENT DISPOSAL OF CROP RESIDUES AND THE PROCESSING AND HANDLING OF HARVESTED MATERIAL TO ASSURE MIXIMUM QUALITY AND PRODUCTION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION CONCERNING THE SIZE AND TYPE OF FARM OPERATION, SELECT HANDLING AND PROCESSING EQUIPMENT NEEDED TO HANDLE THE CROP AND DISPOSE OF THE CROP RESIDUE.
2. WHEN PROVIDED WITH VARIOUS TYPES OF PROCESSING EQUIPMENT, OPERATE THE EQUIPMENT IN A SAFE MANNER AND PERFORM THE NECESSARY PROCESSING AND HANDLING OF THE HARVESTED MATERIAL AND DISPOSAL OF CROP RESIDUES AS RECOMMENDED IN THE OPERATOR'S MANUALS.
3. WHEN GIVEN VARIOUS TYPES OF PROCESSING EQUIPMENT THAT HAVE BEEN IN OPERATION IN THE FIELD, PERFORM THE NECESSARY MAINTENANCE TO INSURE THEIR PROPER OPERATION AS RECOMMENDED IN THE OPERATOR'S MANUALS.

B. INSTRUCTIONAL AREAS

1. SELECTING PROCESSING AND HANDLING EQUIPMENT
    - A. PURPOSE OF VARIOUS TYPES OF MACHINERY FOR PROCESSING AND HANDLING
    - B. IDENTIFYING THE PARTS AND FUNCTIONS OF VARIOUS TYPES OF PROCESSING AND HANDLING EQUIPMENT
    - C. IDENTIFYING THE FARMING PROGRAM AND TIME LIMITATIONS
    - D. DETERMINING THE FINANCIAL RESOURCES AVAILABLE, COST OF EQUIPMENT, AND RETURNS EXPECTED
    - E. IDENTIFYING THE MACHINERY SUPPLIER AND SERVICE AVAILABLE

F. SELECTING THE DESIGN, EASE OF OPERATION, AND ADJUSTMENT, AND THE MANEUVERABILITY OF EQUIPMENT

2. OPERATING PROCESSING AND HANDLING EQUIPMENT

   A. USING THE OPERATOR'S MANUAL FOR DETERMINING PROPER EQUIPMENT OPERATION

   B. OBSERVING SAFETY PRECAUTIONS

   C. LUBRICATING AND ADJUSTING THE EQUIPMENT

3. MAINTAINING THE PROCESSING AND HANDLING EQUIPMENT

   A. USING THE OPERATOR'S MANUAL FOR EQUIPMENT MAINTENANCE

   B. LUBRICATING AND ADJUSTING THE EQUIPMENT

   C. CHECKING FOR WORN AND LOOSE PARTS

   D. PREPARING EQUIPMENT FOR STORAGE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. COLLECT ADVERTISING BULLETINS OF VARIOUS TYPES OF PROCESSING AND HANDLING EQUIPMENT. DETERMINE THE AVAILABLE EQUIPMENT, THE USE FOR WHICH IT WAS DESIGNED, AND THE COST.

2. ASK STUDENTS TO BRING TO CLASS THEIR OPERATOR MANUALS WHICH ARE FOR VARIOUS TYPES OF PROCESSING AND HANDLING EQUIPMENT. DETERMINE WHICH TYPES OF EQUIPMENT REQUIRE THE LEAST MAINTENANCE AND WILL LAST THE LONGEST.

3. IDENTIFY THE NUMBER AND LOCATION OF GREASE FITTING ON VARIOUS TYPES OF PROCESSING AND HANDLING EQUIPMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. DEVELOP A MATCHING TEST WITH TYPE OF CROP AND/OR RESIDUES IN ONE COLUMN AND VARIOUS TYPES OF HANDLING AND PROCESSING EQUIPMENT IN ANOTHER. HAVE STUDENTS CORRECTLY MATCH CROP WITH THE PIECE(S) OF EQUIPMENT APPROPRIATE TO HANDLE THE CROP.

2. HAVE EACH STUDENT CHANGE SCREENS IN THE HAMMER MILL ACCORDING TO DIRECTIONS IN THE OPERATOR'S MANUAL.

3. THE STUDENT SHOULD LUBRICATE, SERVICE, MAKE MINOR REPAIRS, AND ADJUST THE EQUIPMENT NEEDED TO PREPARE RATIONS ACCORDING TO THE SPECIFICATIONS IN THE SERVICE MANUALS AND/OR TO THE SATISFACTION OF THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. OPERATOR MANUALS AND ADVERTISING BULLETINS FOR VARIOUS TYPES OF PROCESSING AND HANDLING EQUIPMENT

2. VARIOUS TYPES OF PROCESSING AND HANDLING EQUIPMENT WHICH CAN BE USED TO DEMONSTRATE THEIR PROPER OPERATION. THIS MAY BE ACCOMPLISHED EASIEST BY FARM VISITS.

3. APPROPRIATE HAND AND POWER TOOLS NEEDED TO ADJUST AND SERVICE PROCESSING AND HANDLING EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. *INDIVIDUAL STUDY GUIDE FOR DRYING CORN ON THE FARM*. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 139 PAGES.

   COVERS SELECTION AND OPERATION OF GRAIN DRYING AND HANDLING EQUIPMENT IN A COMPREHENSIVE MANNER.

2. OPERATOR MANUALS FOR THE EQUIPMENT BEING CONSIDERED.

OPERATING POWER EQUIPMENT SAFELY

UNIT CONCEPT: OPERATING POWER EQUIPMENT IN A SAFE MANNER IS IMPORTANT TO PREVENT DAMAGE TO THE EQUIPMENT, BUT OF GREATER IMPORTANCE IS THE PREVENTION OF CRIPPLING OR FATAL ACCIDENTS TO THE OPERATOR.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH SITUATIONS OF USING FARM POWER EQUIPMENT UNDER SPECIFIED FIELD CONDITIONS WHERE SAFETY HAZARDS MAY OCCUR, DEMONSTRATE THE SAFETY PROCEDURES TO USE, ACCORDING TO SPECIFIC RECOMMENDATIONS FOR EACH HAZARDOUS FIELD CONDITION OF THE NATIONAL SAFETY COUNCIL.

2. WHEN PRESENTED WITH THE PROBLEM OF OPERATING FARM POWER EQUIPMENT ON PUBLIC ROADS, DEMONSTRATE THE OPERATING PROCEDURES AND WARNING DEVICES TO USE ACCORDING TO THE LEGAL REQUIREMENTS OF THE STATE AND RECOMMENDATIONS OF THE NATIONAL SAFETY COUNCIL.

3. WHEN PROVIDED WITH THE PROBLEMS OF OPERATOR PROTECTION AGAINST MOVING PARTS OF THE FARM POWER EQUIPMENT AND THE OTHER EQUIPMENT WITH WHICH IT IS TO BE USED, SELECT AND INSTALL, IF MISSING, ALL SHIELDS, GUARDS AND OTHER PROTECTIVE DEVICES ACCORDING TO THE EQUIPMENT MANUFACTURER SPECIFICATIONS AND RECOMMENDATIONS OF FARM SAFETY SPECIALISTS.

4. WHEN PROVIDED WITH SITUATIONS WHERE THE ENGINE OF THE FARM POWER EQUIPMENT MUST BE OPERATED IN A CONFINED AREA, SELECT AND USE SUITABLE AND ADEQUATE VENTILATION TO PREVENT ASPHIXIATION, ACCORDING TO RECOMMENDATIONS OF FARM SAFETY SPECIALISTS.

5. WHEN PROVIDED WITH THE PROBLEM OF REFUELING FARM POWER EQUIPMENT, SELECT AND USE PROCEDURES THAT WILL PREVENT EXPLOSIONS AND FIRES ACCORDING TO RECOMMENDATIONS OF FARM SAFETY SPECIALISTS.

6. WHEN PROVIDED WITH SITUATIONS OF OPERATING FARM POWER EQUIPMENT WHERE EYE AND EAR DAMAGE MAY RESULT, SELECT AND USE SUITABLE PROTECTIVE DEVICES ACCORDING TO FARM SAFETY AND HEALTH DEPARTMENT RECOMMENDATIONS.

B. INSTRUCTIONAL AREAS

1. DETERMINING SAFE OPERATING PROCEDURES TO PREVENT UPSETS OR OVERTURNS
    - A. DETERMINING SAFE PROCEDURES WHEN OPERATING EQUIPMENT ON SLOPES
    - B. DETERMINING SAFE OPERATING PROCEDURES WHEN PULLING A LOAD UP OR DOWN A HILL
    - C. DETERMINING SAFE OPERATING PROCEDURES NEAR A DITCH BANK
    - D. DETERMINING SAFE PROCEDURES FOR RELEASING STUCK FARM POWER EQUIPMENT
    - E. DETERMINING SAFE TURNING PROCEDURES FOR FARM POWER EQUIPMENT
2. DETERMINING THE STATE LAWS GOVERNING FARM POWER EQUIPMENT OPERATION ON PUBLIC ROADS
3. DETERMINING THE WARNING DEVICES REQUIRED
    - A. DETERMINING COLOR MARKINGS AND SIZE OF SLOW MOVING VEHICLE (SMV) SIGN REQUIRED
    - B. DETERMINING METHOD SMV SIGN SHOULD BE DISPLAYED
    - C. DETERMINING WARNING LIGHT STANDARDS
4. DETERMINING SAFE OPERATING PROCEDURES TO USE WHEN OPERATING FARM POWER EQUIPMENT ON PUBLIC ROADS
    - A. DETERMINING SPEED OF OPERATION
    - B. DETERMINING LOCATION ON HIGHWAY TO TRAVEL
    - C. DETERMINING PROCEDURES TO USE TO ALLOW FAST MOVING TRAFFIC TO PASS
5. DETERMINING POSSIBLE HAZARDS FROM EXPOSED MOVING PARTS
6. SELECTING AND INSTALLING SUITABLE PROTECTIVE DEVICES FOR EXPOSED MOVING PARTS
7. SELECTING SIUTABLE ENGINE EXHAUST REMOVING DEVICES IN ENCLOSED SERVICE AREA

8. REFUELING WITH LIQUID FUELS

   A. CHECKING AGAINST FIRE HAZARDS

   B. DETERMINING HOW FULL TO FILL FUEL TANK WITH FUEL

9. REFUELING WITH LP-GAS

   A. CHECKING FOR GAS LEAKS

   B. PREVENTING EXPLOSIONS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS VIEW MOTION PICTURES, SLIDES OR OTHER VISUALS SHOWING FARM POWER EQUIPMENT BEING OPERATED UNDER FIELD CONDITIONS WHERE ACCIDENTS MAY OCCUR.

   B. HAVE A FARM SAFETY SPECIALIST DISCUSS WITH STUDENTS THE HAZARDOUS RESULTS THAT MAY OCCUR FROM OPERATING FARM POWER EQUIPMENT IN AN UNSAFE MANNER.

2. A. HAVE STUDENTS REVIEW REFERENCES EXPLAINING THE LEGAL RESPONSIBILITIES REGARDING OPERATING FARM POWER EQUIPMENT ON PUBLIC ROADS.

   B. HAVE STUDENTS PREPARE A LIST OF WARNING DEVICES REQUIRED ON FARM POWER EQUIPMENT TO BE OPERATED ON A PUBLIC ROAD AND A DESCRIPTION OF HOW EACH DEVICE SHOULD BE USED ON THE EQUIPMENT.

3. HAVE STUDENTS VISIT A PLACE OF BUSINESS DEALING IN FARM POWER EQUIPMENT AND A FARM WHERE SEVERAL UNITS OF FARM POWER EQUIPMENT ARE PRESENT. HAVE EACH STUDENT PREPARE A LIST OF SAFETY HAZARDS AND EVALUATE THE PROTECTIVE DEVICES THAT ARE BEING USED.

4. PROVIDE STUDENTS WITH REFERENCES REGARDING SAFE REFUELING OF FARM POWER EQUIPMENT AND DISCUSS WITH THEM THE SAFE PRACTICES TO FOLLOW.

5. HAVE STUDENTS VISIT A SERVICE AND REPAIR CENTER OF FARM POWER EQUIPMENT. HAVE THE MANAGER OF THE CENTER DISCUSS WITH STUDENTS THE DEVICES USED TO ELIMINATE EXHAUST FUMES AND THE IMPORTANCE OF THEIR SAFETY PRECAUTIONS.

6. PROVIDE STUDENTS WITH LITERATURE DESCRIBING THE HAZARDS OF INADEQUATE EYE AND EAR PROTECTION, OR HAVE A HEALTH SPECIALIST DISCUSS WITH STUDENTS THE IMPORTANCE OF SUCH PROTECTION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. SHOW STUDENTS SLIDES OR PICTURES EXEMPLIFYING THE USE OF FARM POWER EQUIPMENT UNDER UNSAFE FIELD CONDITIONS. HAVE STUDENTS IDENTIFY THE HAZARD AND EXPLAIN HOW THEY SHOULD BE CORRECTED.

2. HAVE STUDENTS DEMONSTRATE THE CORRECT PROCEDURE FOR EQUIPPING FARM POWER EQUIPMENT WITH WARNING DEVICES FOR PUBLIC ROAD OPERATION, COMPLYING WITH STATE LEGAL REQUIREMENTS.

3. DEVELOP A MATCHING TYPE TEST; ONE SECTION BEING THE MOVING PART INVOLVED IN USING FARM POWER EQUIPMENT, THE OTHER SECTION, A DESCRIPTION OF THE MOST SUITABLE PROTECTIVE DEVICE. ARRANGE THE TWO SECTIONS FOR CORRECTNESS.

4. HAVE STUDENTS DIAGRAM A PROCEDURE FOR SATISFACTORILY ELIMINATING CARBON MONOXIDE GAS FROM A FARM SHOP OR SERVICE CENTER.

5. PROVIDE STUDENTS WITH SPECIFIC SITUATIONS REGARDING REFUELING FARM POWER EQUIPMENT. HAVE THEM CORRECTLY DESCRIBE THE SAFETY PRECAUTIONS TO USE FOR EACH SITUATION.

6. PROVIDE STUDENTS WITH A LIST OF OPERATING CONDITIONS WHERE FARM POWER EQUIPMENT IS USED AND HAVE THEM DETERMINE IF EYE OR EAR HAZARDS ARE PRESENT AND IF SO SELECT THE CORRECT PROTECTIVE DEVICES TO USE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MOTION PICTURES, SLIDES OR OTHER VISUALS SHOWING SAFETY HAZARDS IN OPERATING FARM POWER EQUIPMENT

2. DIAGRAMS OF FARM SHOP OR SERVICE CENTERS SHOWING ADEQUATE VENTILATION DEVICES FOR REMOVING CARBON MONOXIDE GAS

3. SAMPLES OF EYE AND EAR PROTECTIVE DIVICES

4. SAMPLES OF SMV SIGNS AND LIGHTING DIVICES FOR PUBLIC ROAD OPERATION OF FARM POWER EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. FFA SAFETY PROGRAM KIT. CHICAGO, ILLINOIS: NATIONAL SAFETY COUNCIL.

THIS REFERENCE PROVIDES SPECIFIC INFORMATION REGARDING ALL PHASES OF FARM SAFETY INCLUDING FARM POWER EQUIPMENT.

2. HANDLING AND USING GASOLINE AND LP-GAS SAFELY. VAS 3013. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 8 PAGES.

   THIS REFERENCE PROVIDES INFORMATION, INCLUDING A CHECK LIST FOR SAFE HANDLING OF FUELS AND SUGGESTIONS FOR EXTINGUISHING GASOLINE AND LP-GAS FIRES.

3. RESOURCE UNIT ON POWER AND MACHINERY FOR CORE CURRICULUM. TUCSON, ARIZONA: DEPARTMENT OF AGRICULTURAL EDUCATION, THE UNIVERSITY OF ARIZONA.

   PROVIDES TECHNICAL CONTENT FOR MANY OF THE OBJECTIVES AND STUDY AREAS INCLUDED IN THIS UNIT.

4. TRACTOR OPERATION AND DAILY CARE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, PP. 92-95, 95-97, 101-106.

   THIS BOOK PROVIDES THE INFORMATION ON SAFE OPERATION OF FARM POWER EQUIPMENT INCLUDING:

   (1) OPERATING A TRACTOR ON SLOPES, PP. 92-95
   (2) PULLING OUT OF A MUD HOLE OR DITCH, PP. 95-97
   (3) OPERATING A TRACTOR UNDER HIGHWAY CONDITONS, PP. 101-106

DETERMINING WATER DRAINAGE NEEDS

UNIT CONCEPT: DETERMINING THE KINDS AND TYPES OF WATER DRAINAGE NEEDS FOR SPECIFIC PROBLEM SITUATIONS OF A FARM SHOULD [illegible] BASED ON THE PHYSICAL PROPERTIES OF THE SOIL, [illegible] SERIOUSNESS OF THE DRAINAGE PROBLEM, [illegible] TO BE GROWN AND THE COSTS INVOLVED [illegible] OF THE DRAINAGE PROBLEM. THE ABILITY TO DETERMINE THE MOST EFFICIENT AND ECONOMICAL WATER DRAINAGE SYSTEM SHOULD PROVIDE MORE ECONOMY AND EFFICIENCY IN THE CROP PRODUCTION PROGRAM OF A FARM.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH A WATER DRAINAGE PROBLEM, DETERMINE THE KIND AND TYPE OF SYSTEM THAT WILL BE MOST SUITABLE TO USE BASED ON THE PHYSICAL PROPERTIES OF THE SOIL, THE SLOPE OF THE LAND AND THE CROPS TO BE GROWN, AND ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATIONISTS AND DRAINAGE TECHNICIANS.

2. WHEN GIVEN MORE THAN ONE KIND AND TYPE OF WATER DRAINAGE PRACTICE OR SYSTEM, EQUALLY EFFECTIVE, SELECT THE ONE INVOLVING THE LEAST TIME AND COST TO INSTALL, ACCORDING TO CURRENT MATERIAL AND INSTALLATION MACHINERY COSTS AND RECOMMENDATIONS OF DRAINAGE TECHNICIANS AND FARM MANAGEMENT SPECIALISTS.

B. INSTRUCTIONAL AREAS

1. SELECTING DRAINAGE SYSTEMS
    A. DETERMINING PHYSICAL PROPERTIES OF SOILS
        (1) DETERMINING SLOPE
        (2) DETERMINING EROSION PROBLEMS
        (3) DETERMINING WATER PERMEABILITY OF SOILS
    B. DETERMINING THE CROPPING SYSTEM TO BE USED
    C. COMPARING EFFECTIVENESS OF DRAINAGE SYSTEMS
        (1) CALCULATING WATER REMOVAL RATE
        (2) DETERMINING WATER INTAKE INTO SOIL

2. COMPARING COSTS TO ESTABLISH DRAINAGE SYSTEMS

   A. CALCULATING TIME INVOLVED

   B. DETERMINING MATERIAL COSTS

   C. DETERMINING EQUIPMENT COSTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE A SOIL CONSERVATION SERVICE DRAINAGE TECHNICIAN DISCUSS WITH STUDENTS WATER DRAINAGE PROBLEMS COMMON TO THE AREA, AND PROVIDE STUDENTS WITH INFORMATION REGARDING WATER DRAINAGE SYSTEMS USED TO OVERCOME THE PROBLEMS.

   B. HAVE STUDENTS VISIT FARMS HAVING WAT[illegible] DRAINAGE PROBLEMS AND SELECT WATER DRAINAGE SYSTEMS [illegible]VERCOME THE PROBLEM.

   C. SHOW SLIDES, PICTURES OR OTHER VISUALS THAT DESCRIBE WATER DRAINAGE SYSTEMS IN USE.

2. PROVIDE STUDENTS WITH INFORMATION REGARDING COSTS AND TIME REQUIRED TO ESTABLISH WATER DRAINAGE SYSTEMS, AND HAVE THEM MAKE COST COMPARISONS AND TIME-USE CHARTS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING THE WATER DRAINAGE NEEDS OF A FARM AND HAVE THEM SELECT THE SYSTEM OR SYSTEMS TO USE TO OVERCOME THE PROBLEMS TO THE SATISFACTION OF THE INSTRUCTOR.

   B. DEVELOP A MATCHING-TYPE TEST: ONE COLUMN BEING DESCRIPTIONS OF WATER DRAINAGE PROBLEMS; AND THE SECOND COLUMN, A DESCRIPTION OF WATER DRAINAGE SYSTEMS. HAVE STUDENTS ARRANGE THE TWO COLUMNS CORRECTLY.

2. PROVIDE STUDENTS WITH ONE OR MORE WATER DRAINAGE NEED SITUATIONS AND HAVE THEM SELECT A SYSTEM TO OVERCOME THE PROBLEM BASED ON COST AND TIME REQUIRED TO ESTABLISH WITH 90% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUALS SHOWING WATER DRAINAGE PROBLEMS

2. SLIDES, PICTURES OR OTHER VISUALS SHOWING THE ESTABLISHMENT OF DRAINAGE SYSTEMS

F. EXAMPLES OF SUPPORTING REFERENCES

1. SCHWAB, GLENN O., FREVERT, RICHARD K., BARNES, KENNETH K. AND EDMINISTER, TALCOTT W. ELEMENTARY SOIL AND WATER ENGINEERING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC., 1965, 296 PAGES.

   A COLLEGE LEVEL TEXT VALUABLE AS A TEACHER AID FOR OBTAINING TECHNICAL SURVEYING INFORMATION WITH RELATED ENGINEERING PRACTICES.

PLANNING AND CONSTRUCTING SURFACE WATER CONTROL

UNIT CONCEPT: CONTROLLING SURFACE WATER RUN-OFF IS A NEEDED PRACTICE ON MOST CROP PRODUCTION FARMS. SELECTION AND ESTABLISHMENT OF WATER RUN-OFF CONTROL SYSTEMS WILL HELP PREVENT SOIL EROSION, PROVIDE FOR MORE WATER RETENTION IN THE SOIL, AND, THEREBY, INCREASE CROP PRODUCTION EFFICIENCY AND INCREASE THE LAND VALUE.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH THE PROBLEM OF CONTROLLING THE SURFACE WATER OF A FARM, DETERMINE LOCATION ON THE FARM WHERE CONTROL PRACTICES ARE NEEDED, AND SELECT SPECIFIC CONTROL PRACTICES FOR THESE LOCATIONS WITH ACCURACY ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATION TECHNICIANS.

2. WHEN PRESENTED WITH SPECIFIC INFORMATION REGARDING SLOPING CROP LAND IN NEED OF STRIP OR CONTOUR STRIP CROPPING, DETERMINE THE SIZE OF THE STRIPS, LOCATIONS, PROCEDURES FOR ESTABLISHMENT AND CROPPING SEQUENCE TO USE IN THE AREA WITH ACCURACY ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATION TECHNICIANS.

3. WHEN PRESENTED WITH THE PROBLEM [illegible] CONTROLLING SURFACE WATER RUN-OFF BY USE OF TERRACES, DETERMINE THE KIND AND SIZE AND WHERE THE TERRACES SHOULD BE LOCATED, AND SELECT THE LAYOUT PROCEDURES AND PRACTICES FOR ESTABLISHMENT WITH ACCURACY ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATION TECHNICIANS.

4. WHEN PRESENTED WITH THE PROBLEM OF ESTABLISHING SOD WATERWAYS FOR CONTROLLING AND CONDUCTING SURFACE WATER, DETERMINE WHERE THEY SHOULD BE LOCATED, THE SIZE AND SELECT SUITABLE PRACTICES AND PROCEDURES FOR ESTABLISHMENT WITH ACCURACY ACCORDING TO SOIL CONSERVATION TECHNICIANS.

5. WHEN PRESENTED WITH THE PROBLEM OF ESTABLISHING A DIVERSION CHANNEL OR DITCH FOR CONDUCTING SURFACE WATER, DETERMINE THE LOCATION, THE SIZE AND SELECT THE MOST SUITABLE PROCEDURES AND PRACTICES TO USE FOR ESTABLISHMENT ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATION TECHNICIANS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING SURFACE WATER CONTROL PROBLEMS

    A. DETERMINING EROSION DAMAGE FROM SURFACE WATER RUN-OFF

        (1) GULLY FORMATION ON SLOPING LAND
        (2) SHEET EROSION ON SLIGHTLY SLOPING LAND

    B. DETERMINING WET AREAS ON LEVEL LAND

2. SELECTING SYSTEMS TO USE FOR CONTROLLING SURFACE WATER PROBLEMS

    A. SELECTING SYSTEMS FOR CONTROLLING WATER RUN-OFF ON SLOPING LAND

        (1) DETERMINING PERCENT SLOPE
        (2) DETERMINING LENGTH OF SLOPE

    B. SELECTING SYSTEMS FOR CONTROLLING SHEET EROSION ON SLIGHTLY SLOPING TO LEVEL LAND

    C. SELECTING SYSTEMS FOR CONTROLLING WET AREAS

3. PLANNING STRIP CROPPING SYSTEMS

    A. DETERMINING SLOPE PERCENTAGE

    B. DETERMINING SIZE OF AREA TO BE STRIP CROPPED

4. CONSTRUCTING STRIP CROPPING SYSTEMS

    A. CALCULATING WIDTH OF STRIPS TO USE

    B. DETERMINING CROPPING SEQUENCE TO USE

    C. LAYING OUT STRIP AREAS

5. PLANNING CONTOUR STRIP CROP SYSTEMS

    A. DETERMINING SLOPE PERCENTAGE

    B. DETERMINING SIZE OF AREA TO BE STRIP CROPPED

6. CONSTRUCTING CONTOUR STRIP CROPPING SYSTEMS

    A. CONSTRUCTING CONTOUR LINES

    B. DETERMINING WIDTH OF STRIPS

7. PLANNING AND CONSTRUCTING TERRACES

   A. DETERMINING LENGTH AND PERCENTAGE OF SLOPE

   B. SELECTING LOCATION FOR TERRACES

   C. DETERMINING TYPE OF TERRACE TO CONSTRUCT

      (1) DETERMINING WIDTH
      (2) DETERMINING HEIGHT

   D. LAYING OUT TERRACES ON THE CONTOUR OR SLOPE

   E. CONSTRUCTING TERRACE WITH MOLDBOARD PLOW OR OTHER IMPLEMENTS

   F. SELECTING AND ESTABLISHING VEGETATIVE COVER FOR TERRACE

8. PLANNING AND ESTABLISHING SOD WATERWAYS

   A. LOCATING AREAS FOR SOD WATERWAY ESTABLISHMENT

   B. CALCULATING THE CORRECT WIDTH AND DEPTH OF SOD WATERWAYS

   C. SELECTING AND ESTABLISHING VEGETATIVE COVER FOR SOD WATERWAYS

9. PLANNING AND ESTABLISHING DIVERSION CHANNELS

   A. DETERMINING NEED FOR DIVERSION CHANNELS

      (1) DETERMINING AMOUNT OF WATER RUN-OFF FROM SLOPING LAND
      (2) DETERMINING HAZARDOUS EFFECTS OF WATER RUN-OFF ON LEVEL LAND (FIRST AND SECOND BOTTOM LAND)

   B. SELECTING LOCATIONS FOR DIVERSION CHANNELS

      (1) DETERMINING SOD WATERWAY AND TERRACE WATER OUTLETS
      (2) DETERMINING SLOPE REQUIRED FOR DIVERSION CHANNELS

   C. CALCULATING SIZE OF DIVERSION CHANNELS

      (1) DETERMINING WIDTH
      (2) DETERMINING DEPTH

   D. CONSTRUCTING DIVERSION CHANNEL WITH EARTH-MOVING EQUIPMENT

E. SELECTING AND ESTABLISHING VEGETATIVE COVER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. PROVIDE STUDENTS WITH INFORMATION REGARDING PRACTICES OR SYSTEMS USED IN CONTROLLING SURFACE WATER AND DISCUSS WITH THEM SITUATIONS UNDER WHICH THEY SHOULD BE USED.

B. VISIT FARMS OR LAND AREAS WHERE THE CONTROL OF SURFACE WATER IS A PROBLEM AND DISCUSS WITH STUDENTS POSSIBLE SOLUTIONS TO THE PROBLEM.

C. HAVE A SOIL CONSERVATION SERVICE TECHNICIAN PRESENT INFORMATION TO STUDENTS REGARDING SURFACE WATER CONTROL PROBLEMS OF THE AREA AND SUITABLE CONTROL PRACTICES TO USE.

2. A. HAVE STUDENTS PRACTICE LAYING OUT STRIP CROPPING AREAS AND PLAN CROPPING SYSTEMS FOR THE STRIP CROP AREA.

B. HAVE A SOIL CONSERVATION SERVICE TECHNICIAN SHOW STUDENTS PROCEDURES FOR COLLECTING THE NEEDED DATA, CALCULATIONS TO USE PRIOR TO LAYING OUT CONTOUR STRIPS FOR AN AREA, AND PROCEDURES TO USE IN THE AREA FOR LAYING OUT THE CONTOUR STRIPS.

C. HAVE STUDENTS PRACTICE SELECTING POSSIBLE CROPPING PATTERNS FOR A CONTOUR STRIP AREA.

3. A. HAVE STUDENTS VISIT A LAND AREA WHERE TERRACES HAVE BEEN ESTABLISHED AND DISCUSS WITH THEM THE IMPORTANCE OF CONTROLLING SURFACE WATER RUN-OFF.

B. SHOW SLIDES, PICTURES OR OTHER VISUALS SHOWING DIFFERENT TYPES OF TERRACES AND DISCUSS WITH STUDENTS THE SITUATIONS WHERE THEY SHOULD BE USED.

C. VISIT AN AREA OR SHOW SLIDES OR OTHER VISUALS THAT WILL PRESENT INFORMATION IN REGARD TO PROCEDURES FOR CONSTRUCTION OF TERRACES.

4. PROVIDE STUDENTS WITH INFORMATION REGARDING SUITABLE LOCATIONS, SIZE AND VEGETATIVE REQUIREMENTS FOR SOD WATERWAYS AND DISCUSS WITH THEM PROCEDURES FOR ESTABLISHMENT.

5. A. HAVE STUDENTS VISIT AN AREA WHERE DIVERSION CHANNELS ARE IN USE. HAVE THEM LOCATE OUTLETS FOR SOD WATERWAYS AND TERRACES AND THEN DETERMINE HOW DIVERSION CHANNELS PREVENT DAMAGE BY WATER RUN-OFF ON LEVEL LAND.

B. HAVE STUDENTS VISIT LAND AREAS WHERE DIVERSION CHANNELS ARE NEEDED AND SELECT LOCATION AND SIZE OF CHANNELS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS DEMONSTRATE THEIR ABILITY TO SELECT SURFACE WATER CONTROL PRACTICES BY VISITING LAND AREAS WHERE SUCH PRACTICES ARE NEEDED. HAVE EACH STUDENT PREPARE A DIAGRAM OF THE AREAS AND LIST THE WATER CONTROL PRACTICES THAT NEED TO BE INSTALLED.

2. A. HAVE EACH STUDENT DEMONSTRATE LAYING OUT CONTOUR LINES ON SLOPING LAND TO THE SATISFACTION OF THE TEACHER.

   B. PRESENT STUDENTS WITH SPECIFIC INFORMATION REGARDING LAND AREAS IN NEED OF STRIP CROPPING AND CONTOUR STRIP CROPPING. HAVE THEM CALCULATE THE WIDTH OF THE STRIPS FOR THE AREA AND THE CROPPING SEQUENCE TO USE WITH 95% ACCURACY.

3. PRESENT STUDENTS WITH SPECIFIC INFORMATION REGARDING LAND AREAS UPON WHICH TERRACES SHOULD BE ESTABLISHED. HAVE EACH STUDENT PREPARE A DIAGRAM SHOWING WHERE TERRACES SHOULD BE LOCATED AND GIVE THE DIMENSIONS OF THE TERRACES AND PROCEDURES FOR CONSTRUCTING THEM TO THE SATISFACTION OF THE TEACHER.

4. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING A LAND AREA WHERE SOD WATERWAYS SHOULD BE ESTABLISHED. HAVE EACH STUDENT PREPARE A DIAGRAM OF THE AREA SHOWING WHERE THE SOD WATERWAYS SHOULD BE LOCATED AND GIVE THE DIMENSIONS AND PROCEDURES FOR ESTABLISHING A VEGETATIVE COVER.

5. HAVE STUDENTS VISIT A LAND AREA WHERE DIVERSION CHANNELS ARE NEEDED. HAVE EACH STUDENT LOCATE WHERE DIVERSION CHANNELS SHOULD BE LOCATED AND INDICATE THE SIZE OF THE CHANNELS; ALSO, INCLUDE PROCEDURES FOR ESTABLISHING VEGETATIVE COVER, IF NEEDED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. LAND CAPABILITY CHARTS

2. SOIL SURVEY MAPS

3. MEASURING TAPES

4. HAND AND TRIPOD LEVELS

5. MARKING STAKES

6. SLIDES SHOWING ESTABLISHED SURFACE WATER CONTROL PRACTICES

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONTOURING. VAS 4036. URBANA, ILLINOIS: VOCATIONAL AGRICULTURAL SERVICE, UNIVERSITY OF ILLINOIS: 1950, 8 PAGES.

   THIS REFERENCE UNIT DEALS WITH CONTOURING IN A GENERAL MANNER.

2. GRASS WATERWAYS. VAS 4021. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS: 1957, 8 PAGES.

   THIS IS A PUBLICATION ON REASONS FOR ESTABLISHING AND PROCEDURES FOR ESTABLISHING AND MAINTAINING GRASS WATERWAYS FOR DRAINAGE.

3. TERRACING. VAS 4038. URBANA, ILLINOIS: VOCATIONAL AGRICULTURAL SERVICE, UNIVERSITY OF ILLINOIS. 1950, 76 PAGES.

   THIS REFERENCE UNIT DEALS WITH PLANNING AND LAYING OUT TERRACES FOR DRAINAGE AS WELL AS CROPPING PROCEDURES FOR TERRACED AREAS.

4. ASSISTANCE CAN BE ACQUIRED FROM THE LOCAL OFFICE OF THE SOIL CONSERVATION SERVICE WHICH DEALS WITH THE TECHNICAL CONTENT OF THIS UNIT.

PLANNING AND CONSTRUCTING SUB-SURFACE DRAINAGE

UNIT CONCEPT: THE ESTABLISHMENT OF A SUB-SURFACE DRAINAGE SYSTEM MAY INVOLVE CONSIDERABLE EXPENSE. THE PLANNING AND CONSTRUCTION OF SUCH A SYSTEM SHOULD BE DONE CAREFULLY, KEEPING IN MIND ECONOMY AND EFFICIENCY. A SATISFACTORY SUB-SURFACE DRAINAGE SYSTEM SHOULD IMPROVE CROP PRODUCTION AND INCREASE LAND VALUES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH A PROBLEM OF SUPPLYING SUB-SURFACE DRAINAGE, THE PHYSICAL PROPERTIES OF THE SOIL, AND THE AMOUNT OF SLOPE OF THE LAND AREA, DETERMINE THE SIZE OF TILE, THE DEPTH IN THE SOIL THEY SHOULD BE PLACED, AND THE SPACING DISTANCE BETWEEN TILE LINES FOR ALL COMPONENTS OF THE DRAINAGE SYSTEM THAT WILL MOST EFFECTIVELY AND EFFICIENTLY REMOVE THE EXCESS WATER ACCORDING TO DATA AND RECOMMENDATIONS OF SOIL SCIENTISTS AND DRAINAGE TECHNICIANS.

2. WHEN PROVIDED WITH AN AREA TO BE SUB-SURFACE DRAINED, PERFORM PROFILE SURVEYS OF THE AREA WHERE TILE ARE TO BE INSTALLED ACCORDING TO RECOMMENDATIONS OF DRAINAGE TECHNICIANS.

3. WHEN PROVIDED WITH THE DATA OF A PROFILE SURVEY OF A LAND AREA WHERE TILE ARE TO BE INSTALLED FOR SUB-SURFACE DRAINAGE, PREPARE A DRAINAGE PROFILE INFORMATION SHEET SHOWING DEPTH OF TILE AT EACH SURVEY STATION AND THE AMOUNT OF SLOPE OF THE TILE PER 100 FEET ACCORDING TO RECOMMENDATIONS OF DRAINAGE ENGINEERS.

4. WHEN PROVIDED WITH A SUB-SOIL DRAINAGE SYSTEM PLAN FOR A LAND AREA, SELECT THE MOST SUITABLE TILE OUTLET FOR THE SYSTEM ACCORDING TO THE SIZE OF THE DRAINAGE SYSTEM AND RECOMMENDATIONS OF DRAINAGE TECHNICIANS.

5. WHEN PRESENTED WITH A DRAINAGE SYSTEM PLAN AND INFORMATION REGARDING THE LAND AREA TO BE DRAINED, SELECT THE TYPE OF TILE TO USE ACCORDING TO COMPARATIVE COST OF MATERIALS AND INSTALLATION AND RECOMMENDATIONS OF DRAINAGE TECHNICIANS.

6. WHEN PROVIDED WITH INFORMATION ABOUT A DRAINAGE SYSTEM, INCLUDING OVERALL SIZE, TYPE, SIZE OF TILE, AND DEPTH OF

DRAINAGE LINES, SELECT THE TILE LINE INSTALLATION SYSTEM TO USE IN ACCORDANCE WITH COMPARATIVE COSTS, TIME REQUIRED TO INSTALL AND RECOMMENDATIONS OF DRAINAGE TECHNICIANS.

B. INSTRUCTIONAL AREAS

1. DETERMINING SIZE OF TILE TO USE
    - A. DETERMINING WATER MOVEMENT IN SOILS WITH DIFFERENT TEXTURES AND STRUCTURES
    - B. ESTIMATING AMOUNT OF WATER THAT WILL NEED TO BE REMOVED
        - (1) ESTIMATING FOR NORMAL WEATHER CONDITIONS
        - (2) ESTIMATING FOR UNUSUAL WEATHER CONDITIONS
    - C. CALCULATING TILE SIZE FOR BRANCH LINES
    - D. CALCULATING TILE SIZE FOR MAIN LINES
2. DETERMINING SPACING OF BRANCH TILE LINES
    - A. COMPARING WATER MOVEMENT IN SOILS OF VARIOUS TEXTURES AND STRUCTURES
    - B. COMPARING WATER REMOVAL FOR DIFFERENT SIZE TILE LINES
    - C. ESTIMATING AMOUNT OF WATER TO BE REMOVED
    - D. COMPARING WATER REMOVAL FOR DIFFERENT SLOPE PERCENTAGES
3. DETERMINING THE DEPTH TILE SHOULD BE PLACED
    - A. DETERMINING TYPE OF CROPPING SYSTEMS TO BE USED
    - B. DETERMINING TEXTURE AND STRUCTURE OF SOIL
    - C. DETERMINING POSSIBLE DAMAGE TO TILE SYSTEM BY WEATHER CONDITIONS AND/OR HEAVY MACHINERY
    - D. ESTIMATING SLOPES FROM HEADER POINTS TO OUTLETS
4. MAKING PROFILE SURVEYS FOR TILE LINE INSTALLATIONS
    - A. SELECTING OUTLET AND HEADER POINTS FOR TILE LINES
    - B. DETERMINING SURVEY STATION DISTANCES

C. OPERATING THE LEVEL FOR STATION READINGS

(1) DETERMINING BACK SITE READINGS
(2) DETERMINING FORE SITE READINGS

D. RECORDING DATA

5. PREPARING TILE INSTALLATION DATA

A. CALCULATING CUTS TO MAKE FOR EACH STATION

B. PREPARING TILE LINE PROFILE DIAGRAMS

(1) CALCULATING DEPTH OF TILE AT EACH STATION
(2) CALCULATING SLOPE OF TILE

C. INSTALLING STAKES WITH DATA ON STAKE REGARDING DEPTH OF CUT FOR EACH STATION

6. SELECTING KINDS OF MATERIALS TO BE INSTALLED FOR DRAINAGE

A. COMPARING COSTS OF MATERIALS

(1) CLAY TILE
(2) PLASTIC TILE

B. COMPARING COSTS OF INSTALLATION

C. COMPARING TIME REQUIRED FOR INSTALLATION

7. DETERMINING METHOD OF INSTALLATION

A. COMPARING COSTS

B. COMAPRING AVAILABILITY OF INSTALLATION EQUIPMENT

C. COMPARING TIME REQUIRED FOR VARIOUS METHODS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS VISIT A LAND AREA IN NEED OF SUB-SURFACE DRAINAGE. EACH STUDENT SHOULD MAKE A PRELIMINARY SURVEY OF THE AREA AND RECORD DATA IN REGARD TO PHYSICAL PROPERTIES OF THE SOIL, PROBABLE HEADER AND OUTLINE POINTS FOR TILE INSTALLATION AND AN ESTIMATE OF THE SLOPE OF THE AREA. PROVIDE STUDENTS WITH INFORMATION REGARDING SUB-SURFACE DRAINAGE REQUIREMENTS AND HAVE EACH STUDENT PRESENT PLANS FOR TILE SIZE, DEPTH OF INSTALLATION AND DISTANCE OF SPACING.

2. HAVE EACH STUDENT PRACTICE MAKING PROFILE SURVEYS OF AN AREA WHERE A TILE LINE IS TO BE INSTALLED AND RECORD THE DATA FOR FUTURE REFERENCE REGARDING BACK SITE AND FORE SITE READINGS FOR A SERIES OF STATIONS.

3. HAVE EACH STUDENT PREPARE A DIAGRAM OF A PROPOSED TILE LINE PROFILE, CALCULATING AND RECORDING THE DEPTH CUTS FOR EACH PROFILE SURVEY STATION AND THE PERCENT SLOPE FOR THE PROPOSED TILE LINE.

4. FROM INFORMATION PROVIDED, HAVE EACH STUDENT PRACTICE DETERMINING THE MOST SATISFACTORY TILE OUTLET FOR A PROPOSED SUB-SURFACE DRAINAGE AREA.

5. A. STUDENTS SHOULD VISIT LAND AREAS WHERE SUB-SURFACE DRAINAGE SYSTEMS ARE BEING INSTALLED. HAVE EACH STUDENT OBTAIN INFORMATION REGARDING COSTS, TIME REQUIRED AND PROCEDURES INVOLVED IN INSTALLATIONS.

   B. HAVE A DRAINAGE ENGINEER DISCUSS WITH STUDENTS THE ADVANTAGES AND DISADVANTAGES OF KINDS OF MATERIALS USED IN SUB-SURFACE DRAINAGE AND METHODS OF INSTALLATION.

6. HAVE STUDENTS COMPARE COSTS OF VARIOUS INSTALLATION SYSTEMS AND THEN RANK ACCORDING TO LEAST COST.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING ONE OR MORE LAND AREAS IN NEED OF SUB-SURFACE DRAINAGE. HAVE THEM SELECT THE SIZE OF TILE, SPACING BETWEEN TILE BRANCH LINES AND DEPTH IN THE SOIL THAT TILE SHOULD BE PLACED. HAVE THEM ALSO DETERMINE THE SAME FOR THE MAIN TILE LINES.

2. HAVE EACH STUDENT DEMONSTRATE HOW TO MAKE A PROFILE SURVEY USING LAND LEVEL SURVEY INSTRUMENTS FOR A PROPOSED TILE LINE; CALCULATE THE DATA REQUIRED FOR EACH STATION FOR FUTURE USE IN DETERMINING SLOPE AND DEPTH OF CUTS FOR THE PROPOSED TILE LINE.

3. HAVE EACH STUDENT PREPARE A SCALE DIAGRAM SHOWING THE PROFILE OF THE LAND AREA AND THE PROPOSED TILE LINE, GIVING ALL OF THE DATA FOR DEPTH OF CUTS AND THE PERCENT SLOPE OF THE TILE LINE.

4. FROM A PROPOSED SUB-SURFACE DRAINAGE PLAN, HAVE STUDENTS INDICATE THE OUTLET AND DESCRIBE PROCEDURES FOR CONSTRUCTION OF THE OUTLET.

5. PRESENT STUDENTS WITH SPECIFIC INFORMATION REGARDING MATERIALS, EQUIPMENT AND THE LAND AREA TO BE DRAINED. HAVE EACH STUDENT SELECT THE MATERIALS AND METHOD OF INSTALLATION THEY DECIDE IS MOST ADEQUATE FOR THE AREA TO BE DRAINED.

6. HAVE STUDENTS LIST THE FACTORS TO CONSIDER WHEN SELECTING THE TYPE OF TILE LINE SYSTEM TO USE. THIS LIST SHOULD INCLUDE COST, AVAILABILITY OF EQUIPMENT AND TIME REQUIRED FOR COMPLETE ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUALS SHOWING SUB-SURFACE DRAINAGE PROBLEMS AND INSTALLATION

2. TRANSITS OR TRIPOD LEVELS

3. MEASURING TAPES

4. SAMPLES OF TILES AND OTHER MATERIALS USED IN SUB-SURFACE DRAINAGE

5. SLIDES OR PICTURES SHOWING OUTLET CONSTRUCTION OF SUB-SURFACE DRAINAGE

F. EXAMPLES OF SUPPORTING REFERENCES

1. SCHWAB, GLENN O., FREVERT, RICHARD , BARNES, KENNETH K. AND EDMINSTER, TALCOTT W. ELEMENTARY SOIL AND WATER ENGINEERING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1965, 296 PAGES.

   A COLLEGE LEVEL TEXT VALUABLE AS A TEACHER AID FOR OBTAINING TECHNICAL SURVEYING INFORMATION WITH RELATED ENGINEERING PRACTICES.

2. CONTACT YOUR LOCAL SOIL CONSERVATION OFFICE FOR PROFESSIONAL AND TECHNICAL ASSISTANCE AS IT RELATES TO REFERENCE MATERIALS FOR THIS UNIT.

DRAINAGE SYSTEM MAINTENANCE

UNIT CONCEPT: MAINTENANCE OF A DRAINAGE SYSTEM SHOULD INCLUDE PROCEDURES TO USE TO DETERMINE MALFUNCTIONS OF ALL COMPONENTS OF THE SYSTEM AND TO MAKE NEEDED CORRECTIONS OR REPAIRS. PERFORMING ADEQUATE MAINTENANCE JOBS WILL PROVIDE FOR PROPER FUNCTIONING AND PROTECT THE INVESTMENT IN THE DRAINAGE SYSTEM.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PRESENTED WITH EVIDENCE OF A MALFUNCTION IN A SUB-SURFACE DRAINAGE LINE, LOCATE THE MALFUNCTION, AND MAKE THE NEEDED CORRECTIONS, ACCORDING TO RECOMMENDATIONS OF EQUIPMENT MANUFACTURERS AND DRAINAGE TECHNICIANS.

2. WHEN GIVEN THE PROBLEM OF MAINTAINING THE OUTLET FOR A DRAINAGE SYSTEM, DETERMINE AND PERFORM THE CORRECT MAINTENANCE PROCEDURES TO USE ACCORDING TO RECOMMENDATIONS OF DRAINAGE TECHNICIANS.

3. WHEN PRESENTED WITH EVIDENCE OF THE INADEQUATE FUNCTIONING OF A SURFACE DRAINAGE SYSTEM, DETERMINE THE CAUSE AND MAKE THE NECESSARY CORRECTIONS ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATION TECHNICIANS AND TO THE SATISFACTION OF THE TEACHER.

B. INSTRUCTIONAL AREAS

1. LOCATING MALFUNCTIONS IN SUB-SURFACE DRAINAGE LINES
    A. DETERMINING AREAS NOT PROPERLY DRAINED
    B. LOCATING AND INSPECTING DRAINAGE LINES
    C. UNPLUGGING OR REPLACING BROKEN LINES
2. MAINTAINING OUTLETS FOR SUB-SURFACE DRAINAGE SYSTEMS
    A. PROTECTING FROM RODENT ENTRY
    B. PREVENTING EROSION PROBLEMS

3. MAINTAINING SURFACE DRAINAGE SYSTEMS

    A. PLANNING FERTILITY PRACTICES FOR VEGETATIVE COVER OF TERRACES, SOD WATERWAYS AND DIVERSION CHANNELS

    B. CONTROLLING WEED GROWTH IN VEGETATIVE COVER OF TERRACES, SOD WATERWAYS AND DIVERSION CHANNELS

    C. CORRECTING EROSION PROBLEMS IN CULTIVATED AREAS OF CROP LAND

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS, ACCOMPANIED BY A DRAINAGE TECHNICIAN, VISIT A LAND AREA WHERE THE SUB-SURFACE DRAINAGE SYSTEM IS MALFUNCTIONING. HAVE THE DRAINAGE TECHNICIAN DEMONSTRATE TO STUDENTS THE PROCEDURES TO USE IN LOCATING THE MALFUNCTION AND DISCUSS WITH THEM HOW TO CORRECT THE PROBLEM.

2. HAVE STUDENTS OBSERVE IMPROPERLY MAINTAINED OUTLETS BY ACTUAL OBSERVATION OR BY VIEWING SLIDES, PICTURES OR OTHER VISUALS, AND FROM INFORMATION PROVIDED BY REFERENCES, LIST THE MAINTENANCE PROCEDURES TO USE TO CORRECT EXISING PROBLEMS.

3. HAVE STUDENTS VISIT LAND AREAS WHERE CONTOUR STRIP CROPPING, TERRACES, SOD WATERWAYS AND DIVERSION CHANNELS HAVE BEEN ESTABLISHED. HAVE THE LAND OWNER-OPERATOR OR A SOIL CONSERVATION SERVICE TECHNICIAN DISCUSS WITH STUDENTS THE PRACTICES USED IN MAINTAINING THEM.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. HAVE STUDENTS DESCRIBE THE PROCEDURES TO LOCATE A MALFUNCTIONING SEGMENT OF A SUB-SURFACE DRAINAGE SYSTEM WITH 95% ACCURACY.

    B. HAVE EACH STUDENT DESCRIBE PROCEDURES FOR PREVENTION OF MALFUNCTIONS IN A SUB-SURFACE DRAINAGE SYSTEM TO THE SATISFACTION OF THE INSTRUCTOR.

2. SHOW STUDENTS VISUALS OF IMPROPERLY MAINTAINED OUTLETS FOR SUB-SURFACE DRAINAGE SYSTEMS. HAVE EACH STUDENT PREPARE A LIST OF PRACTICES TO USE TO PROPERLY MAINTAIN THE OUTLETS.

3. HAVE STUDENTS OBSERVE THROUGH SLIDES, PICTURES OR VISITS TO LAND AREAS MALFUNCTIONS OF SURFACE DRAINAGE SYSTEMS. HAVE THEM PREPARE A LIST OF THE MALFUNCTIONS AND LIST THE CORRECTIVE PROCEDURES TO USE FOR PROPER MAINTENANCE WITH 90% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUALS SHOWING MALFUNCTIONS OF SURFACE AND SUB-SURFACE DRAINAGE SYSTEMS

2. SLIDES, PICTURES OF OTHER VISUALS SHOWING SUB-SURFACE DRAINAGE OUTLETS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONTOURING. VAS 4036. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1950, 8 PAGES.

   A REFERENCE UNIT WHICH DEALS WITH CONTOURING IN A GENERAL MANNER.

2. GRASS WATERWAYS. VAS 4021. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1957, 8 PAGES.

   A PUBLICATION ON REASONS FOR ESTABLISHING AND PROCEDURES FOR ESTABLISHING AND MAINTAINING GRASS WATERWAYS FOR DRAINAGE.

3. TERRACING. VAS 4038. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1950, 76 PAGES.

   THIS REFERENCE UNIT DEALS WITH PLANNING AND LAYING OUT TERRACES FOR DRAINAGE AS WELL AS CROPPING PROCEDURES FOR TERRACED AREAS.

PLANNING FARM IRRIGATION SYSTEMS

UNIT CONCEPT: INVESTMENT COSTS IN A SYSTEM OF IRRIGATION IS VERY HIGH AND, THEREFORE, REQUIRE A HIGH DEGREE OF PLANNING TO DETERMINE THE RETURNS OF SUCH AN INVESTMENT.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE EFFECT ON CROP PRODUCTION AND THE SOURCE AND AVAILABILITY OF WATER FOR A SPECIFIC SITUATION, DETERMINE WHETHER OR NOT TO INVEST IN IRRIGATION EQUIPMENT TO THE SATISFACTION OF THE INSTRUCTOR.
2. WHEN GIVEN THE LAND TOPOGRAPHY AND THE TYPE OF CROP, DETERMINE THE TYPE OF IRRIGATION SYSTEM TO USE ACCORDING TO RECOMMENDATIONS OF IRRIGATION TECHNICIANS.
3. WHEN GIVEN THE COSTS OF IRRIGATION SYSTEMS AND THE EXPECTED RETURNS OF VARIOUS CROPS, THE STUDENT WILL DETERMINE THE RETURN ON INVESTMENTS IN IRRIGATION SYSTEMS TO THE SATISFACTION OF THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE FEASIBILITY OF IRRIGATION
    - A. IDENTIFYING THE EFFECT ON CROP PRODUCTION
    - B. DETERMINING THE AMOUNT OF WATER NEEDED
    - C. LOCATING SATISFACTORY SOURCES OF WATER
    - D. DETERMINING THE AMOUNT OF WATER AVAILABLE
    - E. DETERMINING THE QUALITY OF THE WATER
2. DETERMINING THE TYPE OF IRRIGATION SYSTEM TO USE
    - A. SELECTING THE METHOD OF APPLICATION
    - B. SELECTING THE SYSTEM TO USE FOR SPRINKLER IRRIGATION
    - C. SELECTING THE SYSTEM TO USE FOR SURFACE IRRIGATION
    - D. SELECTING THE SYSTEM TO USE FOR SUBSURFACE IRRIGATION

3. DETERMINING IRRIGATION COSTS AND RETURNS ON INVESTMENT

   A. DETERMINING COST OF EQUIPMENT

   B. DETERMINING COST OF INSTALLATION AND MAINTENANCE OF THE SYSTEM

   C. CALCULATING ESTIMATED YIELD INCREASES DUE TO IRRIGATION

   D. DETERMINING MONETARY RETURNS EXPECTED

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. VISIT A NEARBY FARM AND DETERMINE THE INCREASE IN CROP PRODUCTION AS A RESULT OF IRRIGATION WHEN COMPARED WITH CROPS NOT IRRIGATED.

2. VISIT FARMS HAVING DIFFERENT TOPOGRAPHY AND CROPS TO OBSERVE DIFFERENT TYPES OF IRRIGATION SYSTEMS IN OPERATION. THEN WRITE ADVANTAGES AND DISADVANTAGES OF EACH SYSTEM OBSERVED.

3. ROLE PLAY FARM MANAGEMENT SITUATIONS IN WHICH THE STUDENT DETERMINES THE FEASIBILITY OF INVESTING IN IRRIGATION EQUIPMENT FOR THE FARM WHERE HE WORKS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS LIST THE FACTORS TO CONSIDER WHEN DETERMINING THE FEASIBILITY OF INSTALLING AN IRRIGATION SYSTEM. THIS SHOULD BE ACCOMPLISHED WITH COMPLETE ACCURACY.

2. DEVELOP A MATCHING TEST THAT ASKS THE STUDENT TO MATCH IRRIGATION SYSTEMS WITH VARIOUS COMBINATIONS OF TOPOGRAPHY AND CROPS TO BE GROWN. STUDENTS SHOULD COMPLETE THE TEST WITH 90% ACCURACY.

3. GIVE STUDENTS COST FIGURES FOR VARIOUS TYPES OF IRRIGATION SYSTEMS AND EXPECTED CROP YIELDS AND HAVE THEM FIGURE THE RETURN ON INVESTMENT WITH 90% ACCURACY.

E. INSTRUCTIONAL AREAS

1. INFORMATION RELATING TO CROP PRODUCTION WITH AND WITHOUT IRRIGATION

2. FARMS IN THE AREA USING DIFFERENT TYPES OF IRRIGATION

F. EXAMPLES OF SUPPORTING REFERENCES

1. PLANNING FOR AN IRRIGATION SYSTEM. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1971, 107 PAGES.

   THIS REFERENCE INCLUDES A COMPREHENSIVE DISCUSSION OF THE CONTENT COVERED IN THIS UNIT AND SHOULD BE QUITE USEFUL AS A STUDENT REFERENCE.

2. CONTACT THE LOCAL OFFICE OF THE SOIL CONSERVATION SERVICE FOR ADDITIONAL TECHNIACAL ASSISTANCE AND REFERENCES CONCERNING IRRIGATION SYSTEMS.

PLANNING AND ESTABLISHING FARM RESERVOIRS

UNIT CONCEPT: THE PLANNING AND ESTABLISHMENT OF A FARM RESERVOIR (POND) SHOULD PROVIDE A SOURCE OF WATER FOR LIVESTOCK AND HUMAN USE, FIRE PROTECTION AND RECREATIONAL USES. IN SELECTING A LOCATION AND ESTABLISHING THE RESERVOIR, CONSIDERATION SHOULD BE GIVEN TO CONVENIENCE, ACCESSIBILITY, WATER CAPACITY, WATER-HOLDING CAPACITY OF THE SUB-SOIL AND COST TO ESTABLISH.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN PROVIDED WITH INFORMATION REGARDING SEVERAL POSSIBLE LOCATIONS FOR ESTABLISHMENT OF THE RESERVOIR, SELECT THE SITE MOST CONVENIENT AND ACCESSIBLE AT THE LEAST COST AND WHERE THE PHYSICAL PROPERTIES OF THE SOIL ARE SUITABLE FOR RETAINING WATER IN ACCORDANCE WITH SPECIFICATIONS OF SOIL CONSERVATION SERVICE TECHNICIANS.

2. WHEN PROVIDED WITH INFORMATION IN REGARD TO A POSSIBLE SITE FOR ESTABLISHMENT OF A FARM RESERVOIR, DETERMINE THE MAXIMUM WATER CAPACITY OF THE RESERVOIR. CALCULATIONS ARE TO BE MADE IN ACCORDANCE WITH RECOMMENDATIONS OF SOIL CONSERVATION SERVICE ENGINEERS.

3. WHEN PROVIDED WITH INFORMATION REGARDING THE SITE FOR THE ESTABLISHMENT OF A FARM RESERVOIR, DETERMINE ALL OF THE DIMENSIONS REQUIRED FOR THE DAM. CALCULATIONS ARE TO BE MADE IN ACCORDANCE WITH RECOMMENDATIONS OF SOIL CONSERVATION SERVICE ENGINEERS.

4. WHEN PROVIDED WITH INFORMATION REGARDING A NEWLY ESTABLISHED RESERVOIR, DETERMINE THE NUMBER AND SPECIES OF FISH TO SUPPLY, COMPLYING WITH RECOMMENDATIONS OF WILDLIFE SERVICES.

5. WHEN PROVIDED WITH INFORMATION REGARDING A NEWLY ESTABLISHED POND AND THE AREA SURROUNDING THE POND, SELECT THE EQUIPMENT NEEDED FOR PROVIDING WATER TO LIVESTOCK AND THE FARM HOME ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATION SERVICE TECHNICIANS.

6. WHEN PROVIDED WITH INFORMATION REGARDING THE LAND SURROUNDING THE WATER AREA OF THE RESERVOIR, SELECT THE NUMBER AND SPECIES OF PLANTS TO USE ACCORDING TO RECOMMENDATIONS OF SOIL CONSERVATION AND WILDLIFE SERVICES.

B. INSTRUCTIONAL AREAS

1. EVALUATING SITES FOR A RESERVOIR

   A. DETERMINING WATERSHED AREA

   B. DETERMINING SUB-SOIL CHARACTERISTICS FOR WATER-HOLDING CAPABILITY

   C. DETERMINING ACCESSIBILITY

      (1) LIVESTOCK WATER SUPPLY
      (2) FIRE PROTECTION
      (3) RECREATIONAL USE

   D. COMPARING COSTS OF CONSTRUCTION

      (1) COST OF DAM CONSTRUCTION
      (2) COST OF SOIL-MOVING OPERATIONS

2. CALCULATING WATER CAPACITIES OF RESERVOIRS

   A. DETERMINING MAXIMUM WATER HEIGHT

   B. DETERMINING SURFACE AREA OF WATER AT MAXIMUM CAPACITY

   C. DETERMINING DEPTHS OF POND AT VARIOUS LOCATIONS

3. DETERMINING THE DIMENSIONS OF THE DAM

   A. CALCULATING FORCES OF WATER AT MAXIMUM CAPACITY

   B. CALCULATING BASE AND TOP DIMENSIONS OF DAM

   C. DETERMINING SIZE AND LOCATION OF SPILLWAY

4. DETERMINING KIND OF FISH AND PROCEDURES FOR ESTABLISHMENT IN RESERVOIR

   A. SELECTING NUMBER AND SPECIES OF FISH

   B. DETERMINING SOURCE OF SUPPLY

   C. DETERMINING APPROPRIATE TIME TO STOCK THE RESERVOIR WITH FISH

   D. PROVIDING SOURCES OF FOOD FOR FISH

5. DETERMINING KINDS OF EQUIPMENT AND MATERIALS FOR SUPPLYING WATER TO LIVESTOCK AND THE FARM HOME

A. SELECTING AND CONSTRUCTING WATERING DEVICES FOR LIVESTOCK

B. SELECTING WATER PUMPS

C. SELECTING AND INSTALLING WATER PIPES

6. DETERMINING VEGETATIVE COVER FOR RESERVOIR AREA

A. SELECTING VEGETATIVE COVER RESISTANT TO TRAMPING

B. SELECTING VEGETATIVE COVER TO PREVENT SOIL EROSION

C. SELECTING VEGETATIVE COVER TO PROVIDE SHADE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE SOIL CONSERVATION TECHNICIAN DISCUSS WITH STUDENTS THE CRITERIA FOR SELECTION OF A RESERVOIR SITE.

B. HAVE STUDENTS VISIT ONE OR MORE LAND AREAS FOR THE PURPOSE OF PRACTICING SELECTING SUITABLE RESERVOIR SITES.

2. PROVIDED WITH REFERENCES CONSISTING OF INFORMATION IN CALCULATING CAPACITIES OF RESERVOIRS, HAVE STUDENTS PRACTICE CALCULATING WATER CAPACITIES WHEN GIVEN DIMENSIONS OF RESERVOIRS.

3. A. PROVIDED WITH WATER CAPACITIES OF ONE OR MORE RESERVOIRS, HAVE STUDENTS CALCULATE THE DIMENSIONS OF THE DAM FOR EACH.

B. FROM DIMENSIONS OF THE DAM OF A RESERVOIR AND THE WATER CAPACITY, HAVE STUDENTS LOCATE AND CALCULATE THE DIMENSIONS OF THE SPILLWAY OF THE DAM.

4. HAVE A REPRESENTATIVE OF THE FISH AND WILDLIFE SERVICE PRESENT TO STUDENTS INFORMATION REGARDING THE SPECIES AND NUMBER OF FISH TO STOCK IN A RESERVOIR OF A GIVEN SIZE.

5. A. HAVE STUDENTS VISIT A RESERVOIR WHERE ADEQUATE FACILITIES ARE IN USE FOR SUPPLYING WATER TO LIVESTOCK AND THE FARMSTEAD.

B. HAVE STUDENTS PRACTICE MAKING PLANS FOR ESTABLISHING ADEQUATE WATER SUPPLY FACILITIES FOR A NEWLY ESTABLISHED RESERVOIR.

6. FROM REFERENCES GIVING RECOMMENDATIONS REGARDING VEGETATIVE COVER FOR A RESERVOIR AREA, HAVE STUDENTS DIAGRAM A VEGETATIVE COVER PLAN FOR A NEWLY ESTABLISHED RESERVOIR.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING SEVERAL SITES FOR RESERVOIR ESTABLISHMENT; HAVE THEM SELECT THE MOST SATISFACTORY ONE JUSTIFYING THEIR SELECTION WITH SEVERAL VALID REASONS SATISFACTORY TO THE INSTRUCTOR.

2. FROM DATA OF A RESERVOIR, HAVE STUDENTS CALCULATE THE MAXIMUM WATER CAPACITY WITH 90% ACCURACY.

3. PROVIDE STUDENTS WITH SPECIFIC INFORMATION REGARDING THE DIMENSIONS OF A RESERVOIR AND THE WATER CAPACITY; HAVE THEM CALCULATE ALL OF THE DIMENSIONS OF THE DAM, AND SHOW THE DIMENSIONS ON A DIAGRAM. INCLUDE ON THE DIAGRAM THE LOCATION AND DIMENSIONS OF THE SPILLWAY.

4. PROVIDE STUDENTS WITH THE WATER CAPACITY AND THE DEPTH OF A RESERVOIR; HAVE THEM SELECT THE SPECIES AND NUMBER OF SPECIES OF FISH TO BE STOCKED IN THE RESERVOIR TO THE SATISFACTION OF THE INSTRUCTOR.

5. FROM A PLAN OR DIAGRAM OF A RESERVOIR AND THE SURROUNDING AREA, HAVE THE STUDENTS INDICATE ON THE PLAN THE WATER SUPPLY EQUIPMENT TO BE USED ACCORDING TO THE RECOMMENDATIONS OF SOIL CONSERVATION TECHNICIANS.

6. USING SEVERAL DIAGRAMS OF RESERVOIR SITES, HAVE STUDENTS MATCH TYPES OF VEGETATIVE MATERIALS APPROPRIATE FOR THESE SITES TO THE SATISFACTION OF THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. SLIDES, PICTURES OR OTHER VISUAL AIDS SHOWING RESERVOIRS ESTABLISHED OR IN THE PROCESS OF BEING ESTABLISHED

2. MEASURING TAPES

3. SURVEY LEVELING INSTRUMENTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. CONSERVATION AID IV - SURVEYING. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 83 PAGES.

   AN EXCELLENT AID FOR THE TEACHER AND THE STUDENT, THIS BOOKLET CONTAINS A STEP-BY-STEP EXPLANATION OF EACH TYPE OF CONSERVATION SURVEYING (DIFFERENTIAL LEVELING, PROFILE LEVELING, TOPOGRAPHIC SURVEYING).

2. SCHWAB, GLENN O., FREVERT, RICHARD K., BARNES, KENNETH K. AND EDMINSTER, TALCOTT W. ELEMENTARY SOIL AND WATER ENGINEERING. NEW YORK, NEW YORK: JOHN WILEY AND SONS, INC. 1967, 296 PAGES.

   A COLLEGE LEVEL TEXT VALUABLE AS A TEACHER AID FOR OBTAINING TECHNICAL SURVEYING INFORMATION WITH RELATED ENGINEERING PRACTICES.

3. SOIL CONSERVATION SERVICE AND THE COOPERATIVE EXTENSION SERVICE

   REFERENCES CAN BE SUPPLIED FROM THE LOCAL OFFICES OF THE ABOVE SERVICES THAT WOULD COMPRISE THE MOST UP-TO-DATE MATERIAL AVAILABLE. THEY CAN ALSO BE OF VALUABLE ASSISTANCE WHEN DISCUSSING THE PROCEDURES FOR ESTABLISHMENT OF RESERVOIRS.

OPERATION AND MAINTENANCE OF IRRIGATION SYSTEMS

UNIT CONCEPT: THE AVAILABILITY OF WATER FOR A CROP IS OF PRIMARY IMPORTANCE FOR MAXIMUM CROP PRODUCTION AND REQUIRES AN IRRIGATION SYSTEM WHICH IS OPERATED AND MAINTAINED TO SUPPLY THE NECESSARY WATER WHEN IT IS NEEDED.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN THE SPRINKLER METHOD OF IRRIGATION, SET UP THE PIPES TO IRRIGATE THE DESIRED AREA WITH MINIMUM LEAKAGE AT THE JOINTS AND MAINTAIN CORRECT PRESSURE THROUGHOUT THE SYSTEM.
2. WHEN GIVEN THE PUMPS, ELECTRIC MOTORS AND/OR GASOLINE ENGINES USED IN AN IRRIGATION SYSTEM, MAINTAIN THEM IN ORDER TO PROVIDE THE WATER PRESSURE FOR WHICH THE IRRIGATION SYSTEM WAS DESIGNED.
3. WHEN GIVEN IRRIGATION EQUIPMENT WHICH REQUIRES WINTERIZING, PORTECT IT FROM RUST, FREEZING, RODENTS, AND LIVESTOCK ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
4. WHEN GIVEN A CROP WHICH REQUIRES PERIODIC IRRIGATION, PROVIDE THE AMOUNT OF WATER AT THE TIME IT IS NEEDED TO PRODUCE THE MAXIMUM YIELD BASED UPON RECENT RESEARCH DATA.
5. WHEN GIVEN A CROP IN NEED OF CHEMICALS, APPLY THE AMOUNT REQUIRED THROUGH IRRIGATION ACCORDING TO PROCEDURES RECOMMENDED BY THE MANUFACTURER AND TO THE SATISFACTION OF THE TEACHER.
6. WHEN GIVEN THE SPRINKLER METHOD OF IRRIGATION, SUPPLY THE IRRIGATION WATER NECESSARY TO PREVENT FROST DAMAGE OR COOL THE CROP DURING HIGH TEMPERATURES ACCORDING TO RECOMMENDED PROCEDURES.

B. INSTRUCTIONAL AREAS

1. MAINTAINING THE PUMP

   A. LUBRICATION AND PACKING

B. ALIGNMENT AND FOUNDATION MAINTENANCE

C. DETERMINING THE PUMP EFFICIENCY AND NECESSARY ADJUSTMENTS

2. SETTING UP AND OPERATING THE IRRIGATION SYSTEM

A. SPRINKLER IRRIGATION

(1) PLANNING THE SPRINKLER SYSTEM LAYOUT
(2) SETTING UP THE SPRINKLER SYSTEM MAINS AND LATERALS

B. SURFACE IRRIGATION

(1) LEVELING AND BORDERING
(2) CONSTRUCTING CANALS, MATERIALS AND DITCHES
(3) PROVIDING IRRIGATION CHECK DAMS, SPILLS, WEIRS, AND SIPHONS

C. SUBSURFACE IRRIGATION

(1) CONSTRUCTING SUPPLY LINES AND DITCHES
(2) PROVIDING CHECK DAMS AND DISPOSAL DITCHES

3. CARING FOR IRRIGATION EQUIPMENT AND ACCESSORIES IN THE OFF SEASON

A. INTERNAL COMBUSTION ENGINES

(1) LUBRICATION
(2) COOLING SYSTEM PROTECTION
(3) IGNITION INSPECTION
(4) ENGINE OPENING PROTECTION
(5) FUEL SYSTEM PROTECTION

B. CARING FOR ELECTRIC MOTORS

(1) LUBRICATING
(2) REMOVING DUST AND DEBRIS
(3) PROTECTING MOTORS FROM WATER, OIL AND DIRT

C. SAFETY SWITCHES AND CONTROLS

(1) CLEANING CORROSION FROM ELECTRIC TERMINALS
(2) ACTIVATING AUTOMATIC SHUTDOWN DEVICES

D. DRIVES

(1) GEAR HEADS
(2) DRIVE SHAFTS
(3) BELT DRIVES

E. PUMPS

- (1) DETERMINING CARE AND MAINTENANCE PROCEDURE FOR TURBINE PUMPS
- (2) DETERMINING CARE AND MAINTENANCE PROCEDURE FOR CENTRIFUGAL PUMPS

F. DISTRIBUTION SYSTEMS

- (1) STORING ALUMINUM TUBING
- (2) CARE OF TRACTOR TOW LINES
- (3) CARE OF SELF-PROPELLED CENTER PIVOTS
- (4) REMOVAL AND STORAGE OF ELECTRIC MOTORS
- (5) DISCONNECTION OF HYDRAULIC HOSES AND PROTECTION OF FITTINGS

4. DETERMINING SOIL MOISTURE

A. IDENTIFYING COMMON TYPES OF DEVICES USED FOR DETERMINING SOIL MOISTURE

- (1) TENSIOMETERS
- (2) ELECTRICAL RESISTANCE

B. APPEARANCE OF PLANTS UNDER VARIOUS SOIL MOSITURE LEVELS

C. IDENTIFYING CLIMATE CONDITIONS AFFECTING SOIL MOISTURE

5. APPLYING CHEMICALS THROUGH THE IRRIGATION SYSTEM

A. DETERMINING ADVANTAGES OF CHEMICAL APPLICATION BY THIS TECHNIQUE

B. IDENTIFYING TYPES OF CHEMICALS WHICH CAN BE USED

- (1) PESTICIDES
- (2) HERBICIDES
- (3) FUNGICIDES
- (4) FERTILIZERS

6. PROTECTING CROPS FROM FROST AND COOLING CROPS DURING HIGH TEMPERATURE

A. FROST PROTECTION WITH IRRIGATION

- (1) FREEZE TOLERANCE OF THE CROP
- (2) DURATION OF THE COLD WEATHER
- (3) CONSIDERATION OF WIND SPEED

(4) TYPE AND CAPACITY OF THE IRRIGATION SYSTEM NEEDED
(5) OPERATION NECESSARY

B. CROP COOLING THROUGH IRRIGATION PRACTICES

(1) PURPOSE
(2) OPERATIONS NECESSARY TO PROVIDE FOR CROP COOLING

7. DETERMINING THE NEED FOR FIELD DRAINAGE

A. IDENTIFYING EFFECTS OF PROPER DRAINAGE

B. PLANNING AND LAYING OUT SYSTEM

C. SOURCES OF TECHNICAL ADVICE

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS STUDY VARIOUS SPRINKLER SYSTEMS AND THEN PRACTICE SETTING UP THE PIPES.

B. HAVE STUDENTS FIGURE THE AMOUNT OF PIPES NEEDED TO IRRIGATE A SPECIFIED AREA USING A SPRINKLER SYSTEM.

2. HAVE STUDENTS MAKE A CHART WHICH GIVES THE MAINTENANCE NEEDED FOR PUMPS, ELECTRIC MOTORS AND/OR GASOLINE ENGINES USED IN IRRIGATION SYSTEMS.

3. HAVE STUDENTS OUTLINE A PROGRAM OF "WINTERIZING" IRRIGATION EQUIPMENT IN THE "OFF SEASONS."

4. HAVE STUDENTS FIGURE THE AMOUNT OF WATER NEEDED AND THE CRITICAL APPLICATION TIMES FOR CROPS IN THE LOCAL AREA.

5. HAVE STUDENTS DETERMINE THE ADVANTAGES - DISADVANTAGES OF DISTRIBUTING CHEMICALS THROUGH THE IRRIGATION SYSTEM.

6. HAVE STUDENTS FIGURE THE AMOUNT OF WATER APPLICATION NEEDED TO PREVENT FROST DAMAGE OR COOL CROPS DURING HIGH TEMPERATURES FOR SPECIFIC KINDS AND AMOUNTS OF FARM CROPS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DEMONSTRATE HIS ABILITY TO PROPERLY SET UP THE PIPES FOR A SPRINKLER IRRIGATION SYSTEM.

2. HAVE EACH STUDENT LIST THE PROCEDURES NECESSARY FOR MAINTAINING EITHER PUMPS, ELECTRIC MOTORS AND/OR GASOLINE ENGINES USED WITH IRRIGATION EQUIPMENT WITH 90% ACCURACY.

3. HAVE EACH STUDENT DEMONSTRATE RECOMMENDED PROCEDURES FOR "WINTERIZING" IRRIGATION EQUIPMENT WITH COMPLETE ACCURACY.

4. HAVE STUDENTS FIGURE THE AMOUNT AND FREQUENCY OF WATERINGS NEEDED TO SUPPLY THE MOSITURE NEEDS OF A SPECIFIC CROP WITH 95% ACCURACY. ALSO PROVIDE THE STUDENTS WITH INFORMATION ABOUT EXISTING SOIL TYPES AND ANNUAL RAINFALL.

5. HAVE EACH STUDENT LIST THE CRITICAL FACTORS TO CONSIDER WHEN APPLYING CHEMICALS TO CROPS THROUGH IRRIGATION SYSTEMS WITH 90% ACCURACY.

6. HAVE EACH STUDENT LIST THE FACTORS TO CONSIDER WHEN USING IRRIGATION SYSTEMS TO PROTECT CROPS FROM CROP DAMAGE. THIS LIST SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: 1) FROST TOLERANCE OF CROP, 2) LENGTH OF COLD WEATHER PERIODS, 3) WIND SPEED, AND 4) AMOUNT OF WATER NECESSARY FOR PROTECTION.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PUMP

2. ELECTRIC MOTOR AND/OR GASOLINE ENGINE

3. IRRIGATION EQUIPMENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. IRRIGATION SALES AND SERVICEMAN. COLLEGE STATION, TEXAS: AGRICULTURAL EDUCATION TEACHING MATERIALS CENTER, TEXAS A & M UNIVERSITY. 100 PAGES.

   INCLUDES INFORMATION SHEETS, TESTING SITUATIONS, AND TRANSPARENCY MASTERS THAT COULD BE USEFUL FOR ACHIEVING THE OBJECTIVES OF THIS UNIT.

2. PLANNING FOR AN IRRIGATION SYSTEM. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1971, 107 PAGES.

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A COMPREHENSIVE MANUAL DEALING WITH OPERATING PROCEDURES FOR VARIOUS TYPES OF IRRIGATION SYSTEMS AND EQUIPMENT.

ELECTRICAL POWER - ITS NATURE AND MEASUREMENT

UNIT CONCEPT: BY USING ELECTRICAL ENERGY, MANY TASKS CAN BE DONE EASIER, FASTER AND MUCH MORE ECONOMICALLY THAN BY MANUAL LABOR. IN ADDITION, ELECTRICAL ENERGY CAN PROVIDE HEAT AND LIGHT AS WELL AS MANY OTHER AUDIO AND VISUAL SERVICES NOT POSSIBLE BY OTHER FORMS OF ENERGY.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN USING THE NAME PLATE INFORMATION FROM LIGHT BULBS, HEATING APPLIANCES AND MOTORS, DETERMINE THE WATT RATING OF EACH.

2. WHEN USING THE METER DISC AND KH OR METER CONSTANT OF A KILOWATT-HOUR METER, CALCULATE THE WATTS OF ELECTRICAL ENERGY CONSUMED BY ANY INDIVIDUAL APPLIANCE OR GROUP OF APPLIANCES TO WITHIN ± 2% ERROR.

3. WHEN GIVEN EITHER A CYCLOMETER OR POINTER-TYPE KILOWATT-HOUR METER READING FOR TWO CONSECUTIVE MONTHS AND THE ELECTRICAL COST FOR THIS PERIOD OF TIME, CALCULATE THE KILOWATT-HOURS OF ELECTRICAL ENERGY USED AND THE AVERAGE COST OF EACH TO THE NEAREST ONE-TENTH CENT.

4. EXPLAIN THE MEANING OF THE FOLLOWING ELECTRICAL TERMS TO THE SATISFACTION OF THE INSTRUCTOR:

   A. CURRENT

   B. AMPERES

   C. VOLTS

   D. WATTS

   E. ALTERNATING CURRENT

   F. CONDUCTOR

   G. INSULATOR

   H. RESISTOR

5. EXPLAIN THE RELATIONSHIP BETWEEN VOLTS, AMPS AND WATTS WELL ENOUGH THAT, GIVEN ANY TWO OF THESE, THE THIRD ONE CAN BE CALCULATED TO THE NEAREST WHOLE NUMBER.

6. WHEN USING CIRCUIT DIAGRAMS OR AN EXPOSED CIRCUIT, DESCRIBE THE MAJOR PARTS OF AN ELECTRICAL CIRCUIT AND THE FUNCTION OF EACH IN PROVIDING ELECTRICAL POWER.

7. DESCRIBE THE FOLLOWING ABOUT ELECTRICAL SHOCK TO THE SATISFACTION OF THE INSTRUCTOR:

    A. WHAT IS IT?

    B. WHAT EFFECTS DOES IT HAVE ON THE HUMAN BODY?

    C. WHAT SAFETY PROCEDURES CAN BE USED TO PREVENT IT?

8. IN A SIMULATED SHOCK SITUATION WHERE A VICTIM IS IN CONTACT WITH LIVE CONDUCTORS, DEMONSTRATE THE ACTIONS TO TAKE TO FREE THE VICTIM WHICH INDICATE AN APPROPRIATE DECISION REGARDING SPEED IN FREEING THE VICTIM AND SAFETY TO THE RESCUER.

9. USING AN ELECTRICAL TEST LAMP, DETERMINE THE FOLLOWING:

    A. WHETHER INDIVIDUAL PARTS OF THE CIRCUIT ARE "HOT" OR "COLD" (INCLUDING APPLIANCE FRAMES OR COVERS)

    B. WHETHER THE CIRCUIT IS 120 OR 240 VOLTS

10. DESCRIBE A MINIMUM OF 6 WAYS IN WHICH ELECTRICAL ENERGY CAN BE CONSERVED WHILE RECEIVING EFFECTIVE AND FULL SERVICE FROM ITS USE.

B. INSTRUCTIONAL AREAS

1. CLASSIFYING THE MAJOR USES MADE OF ELECTRICAL ENERGY

    A. HEAT

    B. LIGHT

    C. POWER (MECHANICAL FORCE)

    D. VISUAL AND AUDIO COMMUNICATIONS

2. DETERMINING THE POWER RATING OF ELECTRICAL APPLIANCES

    A. LOCATING NAME PLATE INFORMATION

        (1) LIGHT BULB STAMPS
        (2) ATTACHED LABELS OR PLATES OF MOTORS AND HEATERS

B. INTERPRETING NAME PLATE INFORMATION

(1) READING WATTAGES DIRECTLY AS A POWER RATING
(2) DETERMINING WATTS AS A PRODUCT OF AMPERES AND VOLTS WHEN WATTS ARE NOT LISTED

3. CALCULATING THE RELATIONSHIP OF ELECTRICAL POWER TO HORSEPOWER

A. CONVERTING THE WATTS OF HEATING AND LIGHTING TO THE FORMULA: 746 WATTS - 1 HORSEPOWER

B. CONVERTING THE HORSEPOWER RATING OF MOTORS TO WATTS OF ELECTRICAL ENERGY

(1) USING 1200 WATTS PER HORSEPOWER FOR FRACTIONAL HORSEPOWER FOR FRACTIONAL HORSEPOWER MOTORS
(2) USING 1000 WATTS PER HORSEPOWER FOR MOTORS OF ONE HORSEPOWER AND LARGER

4. DETERMINING POWER CONSUMPTION BY USING THE KILOWATT-HOUR METER

A. PROCEDURES FOR READING METERS

(1) CYCLOMETER-TYPE METER
(2) DIAL-TYPE METER

B. RECORDING METER READING ON POWER COMPANY CARDS

C. COMPARING METER READINGS FROM TWO CONSECUTIVE MONTHS FOR MONTHLY POWER CONSUMPTION

D. ESTIMATING MONTHLY USE BY MAKING COMPARISON OF READINGS AT 24-HOUR INTERVALS

E. MAKING ONE-MINUTE COUNT OF METER DISC REVOLUTIONS

(1) QUICK ESTIMATES OF POWER CONSUMPTION AT A GIVEN TIME
(2) USE FOR DETERMINING POWER CONSUMPTION OF INDIVIDUAL APPLIANCES

5. CALCULATING THE COST OF ELECTRICAL POWER CONSUMPTION

A. USING THE POWER COMPANY BILLING FOR TOTAL POWER COST

B. DETERMINING THE AVERAGE COST OF A KILOWATT-HOUR OF ELECTRICITY FROM THE MONTHLY BILLING

6. CONSERVING ELECTRICAL ENERGY

   A. CONTROLLING LOSSES FROM HEATING OR COOLING PROCESSES

      (1) PROVIDING ADEQUATE PERMANENT SEALING AND INSULATION OF FACILITIES
      (2) PRACTICING MINIMUM USE OF DOORS AND OPENINGS

   B. MAINTAINING ELECTRICAL APPLIANCES

      (1) CLEANING PROCESSES FOR CONDENSOR OR HEAT EXCHANGERS
      (2) LUBRICATION AND CLEANING OF MOTORS

   C. SETTING THERMOSTATS NO HOTTER FOR HEATING AND NO COOLER FOR COOLING THAN IS NECESSARY

   D. TURNING OFF APPLIANCES WHEN NOT IN USE

   E. KEEPING HEATING AND COOLING PLANTS IN GOOD CONDITION

      (1) REGULAR CHANGING OF FURNACE AND AIR CONDITIONING FILTERS
      (2) REMOVING FROST FROM MANUALLY DEFROSTED REFRIGERATORS OR FREEZERS

7. LEARNING THE MEANING OF ELECTRICAL TERMS

   A. CURRENT

   B. AMPERES

   C. VOLTS

   E. WATTS

   E. ALTERNATING CURRENT

   F. CONDUCTOR

   G. INSULATOR

   H. RESISTOR

8. CALCULATING THE AMOUNTS OF VOLTS, AMPERES OR WATTS

   A. USE OF THE FORMULA FOR DETERMINING VOLTS WHEN AMPERES AND WATTS ARE KNOWN

   B. USE OF THE FORMULA FOR DETERMINING AMPERES WHEN VOLTS AND WATTS ARE KNOWN

C. USE OF THE FORMULA FOR DETERMINING WATTS WHEN AMPERES AND VOLTS ARE KNOWN

9. DEFINING THE PARTS OF A CIRCUIT

A. CONDUCTORS AND INSULATORS

B. CIRCUIT PROTECTING DEVICES

(1) CIRCUIT BREAKERS
(2) FUSES

C. SWITCHES

(1) MANUAL CONTROL
(2) AUTOMATIC CONTROL

D. OUTLETS

10. DEFINING CIRCUIT CONDITIONS

A. PARALLEL CIRCUIT

B. SERIES CIRCUIT

C. SHORT CIRCUIT

11. IDENTIFYING ELECTRICAL SHOCK HAZARDS

A. PROBLEMS WITH SHORTED EQUIPMENT OR APPLIANCES

B. CONTACT WITH BARE PARTS OF THE CONDUCTORS

(1) CONTACT WITH EXTENSION CORD TERMINAL
(2) CONTACT WITH LIGHT BULB SOCKETS
(3) INADEQUATELY INSULATED WIRES

C. SPECIAL HAZARDS CREATED BY WATER AND WATER PIPES

(1) CONTACTS BETWEEN WET SOIL OR FLOORS AND ELECTRICAL CIRCUITS
(2) CONTACTS BETWEEN SINKS, TUBS AND ELECTRICAL CIRCUITS

12. TYPES OF DAMAGE CAUSED BY ELECTRICAL SHOCK

A. PARALYSIS OF MOTOR MUSCLES

B. PARALYSIS OF NERVE CENTER

C. INTERRUPTION OF HEART BEAT RHYTHM

   D. RUPTURING AND DESTRUCTION OF TISSUE BY ELECTRICAL CURRENT FLOW AND HEAT

13. AVOIDING SHOCK HAZARDS

   A. USING PROPERLY INSULATED CONDUCTORS AND APPLIANCES

   B. AVOIDING USE OF ELECTRICAL APPLIANCES IN WET CONDITIONS

   C. AVOIDING DIRECT CONTACT WITH ANY LIVE CONDUCTOR

14. TREATING SHOCK VICTIMS

   A. PROCEDURES FOR REMOVING VICTIM FROM CONTACT WITH LIVE CONDUCTOR

   B. USING RESUSCITATION PROCEDURES FOR ARRESTED BREATHING

   C. KEEPING THE VICTIM WARM AND LYING DOWN

   D. MAKING INITIAL TREATMENTS FOR BURNS UNTIL PROFESSIONAL HELP CAN BE SECURED

15. USING A TEST LAMP FOR DETERMINING "LIVE" CONDUCTORS

   A. CHECKING CIRCUITS FOR "LIVE" CONDUCTORS

   B. DETERMINING IF CIRCUITS ARE 120 OR 240 VOLTS

   C. CHECKING THE APPLIANCE FOR "LIVE" FRAMES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. SURVEY THE HOME OR BUSINESS AND LIST ALL OF THE HEATING, LIGHTING AND MOTORS AND RECORD THE POWER RATING OF EACH. THE INFORMATION CAN BE RECORDED ON A FARM WHICH PROVIDES:

   A. WATT RATING OF LIGHT BULB

   B. WATT RATING OF HEATING APPLIANCES

   C. HORSEPOWER RATING OF MOTORS

      (1) ONE HORSEPOWER MOTORS AND LARGER - 1000 WATTS PER HORSEPOWER
      (2) FRACTIONAL HORSEPOWER MOTORS - 1200 WATTS PER HORSEPOWER

2. SET UP A DEMONSTRATION BOARD IN THE LABORATORY WHICH HAS A KILOWATT-HOUR METER WITH AN APPLIANCE ATTACHED. WITH THE APPLIANCE OPERATING, TIME THE REVOLUTIONS OF THE METER DISC FOR ONE MINUTE. USING THE KH FACTOR, CALCULATE THE WATTS PER HOUR CONSUMED BY THE APPLIANCE.

3. PRESENT A CLASS REPORT SHOWING THE TYPE OF RECORDING AND BILLING PROCEDURES FOLLOWED BY THE LOCAL POWER COMPANY FOR DETERMINING THE ELECTRICAL ENERGY USED IN THE HOME. DEMONSTRATE THE USE OF SCHEDULES BY THE COMPANY IN DETERMINING THE TOTAL COST ON THE BILL.

4. BY USE OF A MANOMETER, BELL WIRE AND A STRONG HORSESHOE MAGNET, DEMONSTRATE ELECTRO-MAGNETIC INDUCTION OF CURRENT. ILLUSTRATE HOW VOLTAGE IS INCREASED OR DECREASED BY CUTTING MAGNETIC LINES OF FORCE AND HOW ALTERNATING CURRENT IS PRODUCED BY ALTERNATING THE DIRECTION IN WHICH THE BELL WIRE CUTS THE LINES OF FORCE. EXPLAIN THE USE OF TERMS SUCH AS VOLTS, CURRENT, AC CURRENT, CONDUCTOR AND INSULATOR IN REGARDS TO THIS ACTIVITY. COMPARE IT WITH THE POWER COMPANY.

5. STUDENTS SHOULD USE DEMONSTRATION PANELS TO ILLUSTRATE THE RELATIONSHIP BETWEEN WATTS, AMPS AND VOLTS. BY ATTACHING A DUAL VOLTAGE MOTOR TO A CIRCUIT WHICH IS MONITORED BY A KILOWATT-HOUR METER, AN AMMETER AND A VOLTMETER, NOTE THE METER DIFFERENCES AS THE MOTOR IS FIRST OPERATED ON 110 VOLTS, THEN ON 240 VOLTS. BY APPLYING PRESSURE TO LOAD THE MOTORS, CHANGES CAN BE NOTED IN AMPS-VOLTS RELATIONSHIP.

6. USE EITHER A NEW BUILDING CONSTRUCTION WHERE THE WIRING HAS NOT BEEN ENCLOSED YET OR ONE WHERE SURFACE WIRING HAS BEEN USED. DIAGRAM ALL OF THE PARTS OF THE CIRCUITS USING THE COMMONLY ACCEPTED ELECTRICAL SYMBOLS.

7. PREPARE BULLETIN BOARD DISPLAY OF PICTURES INDICATING HAZARDOUS SHOCK SITUATIONS AND THE WAYS IN WHICH ELECTRICAL SHOCK AFFECTS THE HUMAN BODY.

8. HAVE A LOCAL RESCUE OR EMERGENCY SQUAD MAN DEMONSTRATE PROCEDURES FOR FREEING AN ELECTRICAL VICTIM AND THE FIRST AID PROCEDURES FOR AIDING THE VICTIM UNTIL HELP ARRIVES. STUDENTS CAN WORK IN PAIRS TO PRACTICE RESUSCITATION TECHNIQUES.

9. HAVE EACH STUDENT PURCHASE A 240-VOLT BULB, WEATHER-PROOF SOCKET AND ENOUGH WIRE TO CONSTRUCT A TEST LAMP FOR HIS OWN USE.

10. SURVEY HOME SITUATIONS AND DEVELOP A LIST OF WAYS IN WHICH ELECTRICAL ENERGY IS NOT BEING USED AS EFFICIENTLY AS POSSIBLE AND MAKE A REPORT TO THE CLASS OF PROPOSED PLANS FOR IMPROVING THE HOME SITUATION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. ASSEMBLE A GROUP OF COMMON ELECTRICAL APPLIANCES AND EVALUATE EACH STUDENT'S ABILITY TO CONVERT HORSEPOWER RATING OF MOTORS TO ACCEPTABLE THUMB-RULES FOR WATTS.

2. HAVE STUDENTS WORK IN PAIRS WITH ONE STUDENT DETERMINING THE DISC REVOLUTION AND CALCULATING THE WATTS CONSUMED IN A ONE-MINUTE OBSERVATION. THE OTHER STUDENT CAN CHECK ON THE ACCURACY OF THE TIME AND METER DISC COUNT. THE STUDENT BEING EVALUATED SHOULD BE ABLE TO USE THE DISC CONSTANT OR KH FACTOR TO DETERMINE THE WATTS TO WITHIN ± 2% OF THE ACTUAL.

3. PAPER AND PENCIL TESTS SHOULD BE GIVEN USING DATA FROM SIMULATED METER READINGS AND POWER COMPANY BILLINGS. EACH STUDENT SHOULD BE ABLE TO ACCURATELY IDENTIFY THE WATTS USED PER MONTH AND CALCULATE THE AVERAGE COST PER KILOWATT-HOUR.

4. A PAPER AND PENCIL TEST SHOULD EVALUATE THE STUDENT'S UNDERSTANDING OF ELECTRICAL TERMS BY MATCHING TERMS TO DESCRIPTIONS OR GIVEN TERMS AND/OR BY COMPLETING APPROPRIATE DESCRIPTIONS. A MINIMUM OF TERMS TO USE SHOULD INCLUDE: CURRENT, AMPERES, VOLTS, WATTS, ALTERNATING CURRENT, CONDUCTOR, INSULATOR, RESISTOR.

5. EVALUATION SHOULD DETERMINE THE STUDENT'S ABILITY TO CALCULATE EITHER AMPS, VOLTS OR WATTS WHEN TWO OF THESE FACTORS ARE LISTED AND ONE IS NOT. THE CALCULATIONS SHOULD BE ACCURATE TO THE NEAREST WHOLE NUMBER.

6. DIAGRAMS OF SIMPLE ELECTRICAL CIRCUITS CONTAINING CONDUCTORS, SWITCHES AND OUTLETS OR RESISTORS SHOULD BE USED TO DETERMINE IF THE STUDENT CAN CORRECTLY IDENTIFY EACH PART OF THE CIRCUIT AND WRITE AN ACCURATE DESCRIPTION OF THE FUNCTION OF THE PART.

7. THE STUDENT SHOULD COMPLETE AN ESSAY-TYPE RESPONSE EXPLAINING THE MAJOR TYPES OF EFFECTS THAT ELECTRICAL SHOCK HAS ON THE BODY AND WAYS IN WHICH ELECTRICAL SHOCK CAN BE AVOIDED.

8. EACH STUDENT SHOULD BE EVALUATED ON THE METHOD AND SPEED HE USES TO FREE A SHOCK VICTIM FROM A SIMULATED CONTACT

WITH "LIVE" CONDUCTORS. SPEED IS A CRITICAL FACTOR BUT THE STUDENT SHOULD DEMONSTRATE A METHOD WHICH DOES NOT SACRIFICE SAFETY OF THE RESCUER. THE STUDENT SHOULD ALSO DEMONSTRATE EFFECTIVE FIRST AID TECHNIQUES FOR SIMULATED SHOCK AND BURN CONDITIONS.

9. EACH STUDENT SHOULD DEMONSTRATE THAT HE CAN USE A DUAL VOLTAGE TEST LAMP TO ACCURATELY IDENTIFY "LIVE" ELECTRICAL CONDITIONS. A MINIMUM EVALUATION SHOULD INCLUDE IDENTIFYING HOT CONDUCTORS OR TERMINALS IN A JUNCTION BOX, SERVICE ENTRANCE PANEL OR OUTLET BOX AS WELL AS THE FRAME OR HOUSING OF AN ELECTRICAL APPLIANCE. SINCE LIVE CURRENT IS NEEDED TO DEMONSTRATE THESE SKILLS, SAFETY IS IMPORTANT. THE STUDENT SHOULD BE ABLE TO EXPLAIN AND DEMONSTRATE TEST PROCEDURES WHICH WILL AVOID SHOCK HAZARD.

10. EACH STUDENT SHOULD LIST A MINIMUM OF 6 PRACTICES OR CONDITIONS WHICH WOULD CONSERVE ELECTRICAL ENERGY WITHOUT NECESSARILY REDUCING THE SERVICE NORMALLY EXPECTED OF ELECTRICITY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. DEMONSTRATION EQUIPMENT INCLUDING ENTRANCE PANELS, CIRCUITRY CABLE, TOGGLE SWITCHES, CONVENIENCE OUTLETS, AMMETER, KILOWATT-HOUR METER, VOLTMETER, 140-VOLT LIGHT BULB, WEATHER-PROOF LIGHT BULB SOCKET

2. ELECTRICAL APPLIANCES SUCH AS TABLE LAMPS, PORTABLE ROOM HEATERS, MOTORS (DUAL VOLTAGE)

3. NEEDLE NOSE PLIERS, PLASTIC ELECTRICAL TAPE, SOLDERING GUNS, SOLDER, FLUX, SCREWDRIVERS, WIRE STRIPPERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. RICHTER, H. P. WIRING SIMPLIFIED. 30TH EDITION. MINNEAPOLIS, MINNESOTA: PARK PUBLISHING, INC. 1971, 144 PAGES.

   THIS REFERENCE IS BASED ON THE NATIONAL ELECTRICAL CODE 1971 AND BRINGS OUT "WHY" THINGS ARE DONE IN A PARTICULAR WAY. MANY OF THE ELECTRICAL INSTALLATIONS THAT CAN BE MADE BY HOMEOWNERS AND SMALL BUSINESS OPERATIONS ARE DESCRIBED AND ILLUSTRATED SO THAT THE FINISHED JOB WILL BE PRACTICAL AND SAFE.

2. UNDERSTANDING AND MEASURING HORSEPOWER: MOTORS, ENGINES, TRACTORS. ATHENS, GEORGIA: COORDINATOR'S OFFICE, AMERICAN ASSOCIATION FOR AGRICULTURAL ENGINEERING AND VOCATIONAL AGRICULTURE. 1969, 72 PAGES.

   THIS IS A COMPREHENSIVE AND ILLUSTRATED STUDENT REFERENCE WHICH COVERS THE MAJOR STUDY AREAS OF: UNDERSTANDING HORSEPOWER, DETERMINING THE SIZE OF POWER UNIT TO USE, SELECTING A DYNAMOMETER, AND MEASURING HORSEPOWER AND INTERPRETING THE RESULTS.

3. UNDERSTANDING ELECTRICITY AND ELECTRICAL TERMS: THEIR MEANING AND USE. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1970, 32 PAGES.

   THIS IS AN ILLUSTRATED STUDENT REFERENCE THAT DESCRIBES THE TERMS: CIRCUIT, CONDUCTORS AND INSULATORS, RESISTANCE, VOLTS, 3-PHASE, AND KILOWATT-HOUR. IT ALSO DESCRIBES HOW TO DETERMINE THE AMOUNT OF ELECTRICAL ENERGY USED AND THE OPERATING COST.

SELECTION AND USE OF CONDUCTORS

UNIT CONCEPT: SAFETY, LONG-SERVICE LIFE AND ECONOMICAL USE OF ELECTRICAL POWER DEPENDS UPON SELECTING AN APPROPRIATE SIZE AND TYPE OF CONDUCTOR AS WELL AS THE TYPE OF INSULATING MATERIAL FOR THE CONDUCTOR.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DESCRIBE TO THE SATISFACTION OF THE INSTRUCTOR THE PROBLEMS OF EXCESSIVE HEATING OF WIRES, AND POOR EQUIPMENT OPERATION CAUSED BY WIRES OF INSUFFICIENT SIZE.

2. WHEN GIVEN AN EXISTING WIRING SITUATION, DETERMINE THE ADEQUACY OF THE EXISTING CONDUCTORS ON A CIRCUIT IN ACCORDANCE WITH STANDARDS BY THE NATIONAL ELECTRICAL CODE FOR AMPACITY RATINGS.

3. WHEN GIVEN AN EXISTING WIRING SITUATION WHICH HAS AN INADEQUATE WIRE SIZE FOR THE LOAD, DESCRIBE AN APPROPRIATE SOLUTION TO THE SITUATION WHICH MEETS STANDARDS DEFINED BY THE NATIONAL ELECTRICAL CODE.

4. FOR A PROPOSED WIRING INSTALLATION, SELECT THE TYPE OF METAL AND WIRE SIZE AS WELL AS THE TYPE OF CONDUCTOR INSULATION WHICH CONFORMS TO STANDARDS DEFINED BY THE NATIONAL ELECTRICAL CODE.

5. USING ANY OF 6 COMBINATIONS OF ABBREVIATED CODES ON ELECTRICAL DEVICES REGARDING COMPATIBILITY OF TERMINALS WITH CONDUCTORS, ACCURATELY SELECT DEVICES WHICH HAVE TERMINALS COMPATIBLE WITH THE TYPE OF CONDUCTOR USED (ALUMINUM OR COPPER).

B. INSTRUCTIONAL AREAS

1. SELECTING ELECTRICAL CONDUCTORS
   - A. DETERMINING PROBLEMS CAUSED BY WIRE CONDUCTORS OF INADEQUATE SIZE
     - (1) EXCESSIVE HEAT
       - (A) POTENTIAL FIRE HAZARD
       - (B) POTENTIAL SHOCK HAZARD

(C) WASTED ENERGY IN HEAT

(2) LOW VOLTAGE AND POOR EQUIPMENT OPERATION
(3) TRIPPING OF CIRCUIT BREAKERS OR BLOWING OF FUSES
(4) EXCESSIVE COSTS TO OPERATE ELECTRICAL APPLIANCE

B. DETERMINING ADEQUACY OF EXISTING WIRE SIZE

(1) DETERMINING SIZE OF EXISTING WIRES

(A) WIRE GAUGE
(B) CRUDE COIN TEST
(C) INSULATION CODES

(2) CALCULATING THE ELECTRICAL LOADS OF CIRCUITS

(A) TOTALING THE AMPERAGE RATING FROM NAMEPLATE INFORMATION
(B) USING THE FORMULA AMPS X VOLTS = WATTS TO DETERMINE AMPERAGE OF APPLIANCE HAVING ONLY WATT/VOLT INFORMATION

(3) DETERMINING THE LOAD LIMIT OR AMPACITY OF CONDUCTORS

(A) THE EFFECT OF THE TYPE OF METAL ON CURRENT-CARRYING CAPACITY

1. COPPER
2. ALUMINUM

(B) HOW THE LENGTH OF THE CIRCUIT AFFECTS AMPACITY
(C) 120 VOLTS VERSUS 240 VOLTS
(D) VOLTAGE DROP LIMITATIONS

1. MOTORS
2. LIGHTS

C. CURING INADEQUATE WIRING

(1) SPLITTING OVERLOADED CIRCUITS
(2) REPLACING WITH LARGER WIRE - DETERMINING WHEN THE EXTRA COST OF LARGER WIRES IS GOOD ECONOMICS
(3) SHORTENING CIRCUITS

D. DETERMINING THE WIRING CLASSIFICATION FOR A WIRING JOB

(1) STYLE OF WIRE

- (A) SINGLE-CONDUCTOR WIRE
- (B) BARE GROUND WIRE
- (C) FLEXIBLE LAMP CORD (PARALLEL) - SPT-1, SPT-2
- (D) FLEXIBLE LAMP CORD (TWISTED) - C, PD
- (E) PORTABLE CORD - SJ, SJO, SJT, SJTO
- (F) REINFORCED PORTABLE CORD - S, SO, ST, STO
- (G) CABLE

(2) TYPES OF WIRE FOR OUTDOOR USE

- (A) OVERHEAD - TW, THW, N-SD, (MSGR TYPE), USE
- (B) UNDERGROUND - USE, UF, SEU, TW, THW, RHW
- (C) SERVICE ENTRANCE

(3) TYPES OF WIRE FOR INTERIOR USE

(A) DRY CONDITIONS

1. NON-METALLIC SHEATHED (NM)
2. ARMORED CABLE (AC)

(B) DAMP OR CORROSIVE CONDITIONS

1. NON-METALLIC SHEATHED (NMC)
2. UNDERGROUND FEEDER (UF)

(C) CONDUIT, RIGID METALLIC, PLASTIC, THIN WALL METALLIC

(4) TYPES OF WIRES FOR SPECIAL APPLICATIONS

- (A) HEATER CORD - HPD, HPN
- (B) BELL WIRE
- (C) REMOTE CONTROL WIRE

E. MAKING COMPATIBLE CONNECTIONS WITH ALUMINUM OR COPPER CONDUCTORS

(1) ELECTRICAL APPLIANCE TERMINALS

- (A) NO CODE
- (B) CU/CU
- (C) CU/AL
- (D) AL/AL
- (E) AL
- (F) CU
- (G) CO/ALR

(2) CONNECTIONS WITH COPPER AND ALUMINUM WIRING

(A) USE OF ANTI-OXIDANT PASTE FOR ALUMINUM
(B) USE OF SOLDERLESS CONNECTORS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS OBSERVE A DEMONSTRATION WHERE A COMPARISON IS MADE BETWEEN A 100-FOOT COIL OF 18-2 CABLE AND A 100-FOOT COIL OF 12-2 CABLE. A LOAD OF 10,000 TO 12,000 WATTS SHOULD BE PLACED UPON EACH COIL TO DEMONSTRATE THE EFFECT A HIGH AMPERAGE LOAD HAS UPON THE HEATING IN EACH OF THE TWO CABLES. ALSO, VOLTMETERS AND WATTMETERS SHOULD BE USED TO DETERMINE THE DIFFERENCES IN VOLTAGE AND WATTS AVAILABLE BETWEEN THE SOURCE AND THE LOAD OF EACH CABLE. STUDENTS SHOULD NOTE AND RECORD THE DIFFERENCES IN THE PERFORMANCE OF EQUIPMENT ON EACH OF THE CABLES.

2. HAVE EACH STUDENT SURVEY AN EXISTING CIRCUIT FOR THE SIZE OF WIRE, LENGTH OF THE CIRCUIT AND, BY THE USE OF AN AMPACITY CHART, DETERMINE THE AMPACITY OF THE CIRCUIT.

3. HAVE THE STUDENTS RECOMMEND AND DESCRIBE IN DETAIL A PROPOSED METHOD FOR CORRECTING A CIRCUIT WHICH IS OVERLOADED. THE PROPOSAL SHOULD EXPLAIN WHY THE RECOMMENDED METHOD SHOULD BE CONSIDERED OVER OTHER ALTERNATIVES.

4. HAVE EACH STUDENT MAKE A PRESENTATION TO THE CLASS DESCRIBING A CHOICE OF CONDUCTING MATERIAL FOR A GIVEN CIRCUIT CONDITION. THE STUDENT SHOULD DESCRIBE THE CODE REGULATIONS ON THE MATERIALS, THE AVAILABILITY, COST AND MAJOR CHARACTERISTICS OF THE MATERIAL.

5. HAVE THE STUDENTS PREPARE A BULLETIN BOARD DISPLAY SHOWING EXAMPLES OF COMPATIBILITY CODES USED TO INDICATE THE APPROPRIATE USE OF COPPER AND ALUMINUM CONDUCTORS AT APPLIANCE TERMINALS ACCORDING TO THE NAME PLATE INFORMATION.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. BY THE USE OF AN ESSAY OR COMPLETION-TYPE EVALUATION, DESCRIBE WHAT EFFECT INADEQUATE WIRE SIZE HAS ON SAFETY, ON LOSS OF ELECTRICAL ENERGY, AND ON THE PERFORMANCE OF EQUIPMENT. AFTER A DEMONSTRATION BY THE INSTRUCTOR USING TWO 100-FOOT ROLLS OF ELECTRIC CABLE (18-2 AND 12-2), THE STUDENT SHOULD CORRECTLY REPORT THE DIFFERENCES IN VOLTAGE AND WATTAGE BETWEEN EACH OF THE TWO COILS AT THE APPLIANCE END.

2. THE STUDENT SHOULD USE EITHER A WIRE GAUGE OR THE INSULATION CODE TO DETERMINE WIRE GAUGE SIZE, THEN DETERMINE IF THE SIZE IS ADEQUATE FOR THE CURRENT LOAD, AND LENGTH OF CIRCUIT ACCORDING TO AMPACITY CHART DATA.

3. THE STUDENT SHOULD PROPOSE A SOLUTION TO AN INADEQUATE WIRE SIZE SITUATION SO THAT THE LOADS ON ANY CIRCUIT WOULD BE WITHIN NATIONAL ELECTRICAL CODE 1971 OR EQUIVALENT CODE STANDARDS.

4. THE STUDENT SHOULD BE GIVEN CIRCUIT CONDITIONS REQUIRING VARIOUS SIZES OF CONDUCTORS AND TYPES OF INSULATION. THE STUDENT SHOULD SELECT SIZE OF CONDUCTORS WHICH ARE ADEQUATE BUT NOT OVER THE SIZE TO HANDLE ANTICIPATED LOADS ON THE CIRCUIT. THE INSULATION SHOULD BE APPROPRIATE FOR THE NATURE OF THE CIRCUIT. ELECTRICAL CODES OR STANDARDS SHOULD BE AVAILABLE TO THE STUDENT IN MAKING HIS DETERMINATIONS.

5. THE STUDENT SHOULD SELECT THE PROPER USE OF 5 OR MORE OF THE ABBREVIATED CODE COMBINATIONS: CU/ALR, CU/CU, CU/AL, AL/AL, AL, CU OR NOT CODE.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. DEMONSTRATION EQUIPMENT: 100 FEET OF 12-2 CABLE OR CORD, 100 FEET OF 18-1 CORD, 2KWH METERS, VOLTMETERS, AMMETERS, TWO 600-WATT HEATING ELEMENTS, LIGHT METER, LAMP OUTLET AND 100-WATT LIGHT BULB, SMALL AIR CIRCULATING FAN

2. WIRE GAUGES, NATIONAL ELECTRICAL CODE 1971, LOCAL ELECTRICAL CODES, APACITY CHARTS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL WIRING HANDBOOK. NEW YORK, NEW YORK: AGRICULTURAL MARKETING DIVISION, EDISON ELECTRIC INSTITUTE. 1971, 75 PAGES.

   THIS BOOK IS DEVOTED ENTIRELY TO FARM WIRING. IT IS WRITTEN AS A BOOK ON HOW TO PLAN WIRING RATHER THAN BEING CONCERNED WITH TYPES OF MATERIALS OR METHODS OF WIRING. IT GENERALLY CONSISTS OF RECOMMENDATIONS AND SUGGESTIONS FOR SIZES OF CONDUCTORS, NUMBER AND LOCATION OF OUTLETS AND SIMILAR FACTORS FOR VARIOUS LIVESTOCK, POULTRY AND CROP OPERATIONS IN ADDITION TO RESIDENTIAL SPECIFICATIONS.

2. NATIONAL ELECTRICAL CODE 1971. BOSTON, MASSACHUSETTS: NATIONAL FIRE PROTECTION ASSOCIATION. 1971, 536 PAGES.

THE CODE IS AN ADVISORY PRESENTATION OF SAFE PRACTICES FOR ELECTRICAL INSTALLATIONS. WHILE THE CODE HAS NO LEGAL POWER OR CONTROL, IT IS OFTEN USED BY LAW AS A STANDARD FOR REGULATORY PURPOSES IN THE INTEREST OF LIFE AND PROPERTY PROTECTION. THE PRESENTATION GIVES THE "WHAT" AND "HOW" OF WIRING BUT IS NOT INTENDED TO PROVIDE THE "WHY." THE NATIONAL ELECTRICAL CODE IS PERIODICALLY UPDATED AND THE NATIONAL ELECTRICAL CODE 1974 IS SCHEDULED FOR PUBLICATION IN SEPTEMBER OF 1974 BECOMING EFFECTIVE EARLY IN 1975.

3. RICHTER, H. P. WIRING SIMPLIFIED. 30TH EDITION. MINNEAPOLIS, MINNESOTA: PARK PUBLISHING, INC. 1971, 144 PAGES.

THIS REFERENCE IS BASED ON THE NATIONAL ELECTRICAL CODE 1971 AND BRINGS OUT "WHY" THINGS ARE DONE IN A PARTICULAR WAY. MANY OF THE ELECTRICAL INSTALLATIONS THAT CAN BE MADE BY HOMEOWNERS AND SMALL BUSINESS OPERATIONS ARE DESCRIBED AND ILLUSTRATED SO THAT THE FINISHED JOB WILL BE PRACTICAL AND SAFE.

4. SIMPLIFIED ELECTRIC WIRING HANDBOOK. CHICAGO, ILLINOIS: SEARS, ROEBUCK AND COMPANY. 1964, 55 PAGES.

THIS REFERENCE IS A WELL-ILLUSTRATED STEP-BY-STEP PRESENTATION OF PLANNING AND INSTALLING MANY TYPES OF ELECTRICAL CIRCUITS AND DEVICES. SPECIFIC WIRING TECHNIQUES ARE GIVEN FOR MANY OF THE COMMON INSTALLATION PROCESSES.

WIRING PROCEDURES FOR SIMPLE CIRCUITS

UNIT CONCEPT: ELECTRICAL CIRCUITS WHICH ARE SAFE, EFFICIENT AND CONVENIENT CAN BE ACHIEVED BY SELECTING THE CORRECT MATERIALS AND FOLLOWING APPROPRIATE PROCEDURES FOR INSTALLING THE WIRING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN NECESSARY MATERIALS INCLUDING SINGLE POLE THROW SWITCH AND LIGHT BULB RECEPTACLE, FOLLOW A SCHEMATIC PLAN AND BUILD A CIRCUIT WHICH HAS THE WIRE INSULATION PROPERLY PREPARED AND ALL CONNECTIONS MADE ACCORDING TO SAFE GROUNDING AND POLARIZED WIRING PROCEDURES.

2. WHEN GIVEN THE NECESSARY MATERIALS, INCLUDING TWO DUPLEX GROUNDING RECEPTACLES AND A SINGLE-POLE SINGLE THROW TOGGLE SWITCH, FOLLOW SCHEMATIC PLANS TO COMPLETE A CIRCUIT THAT HAS ONE DUPLEX RECEPTACLE SWITCHED AND THE OTHER UNSWITCHED WITH ALL WIRE INSULATION PROPERLY PREPARED AND ALL CONNECTIONS MADE ACCORDING TO SAFE GROUNDING AND POLARIZED WIRING PROCEDURES.

3. WHEN GIVEN THE NECESSARY MATERIALS, BUILD THREE WIRING ARRANGEMENTS OF THREE-WAY SWITCHING:

   A. SOURCE - SWITCH - SWITCH - LAMP

   B. SOURCE - LAMP - SWITCH - SWITCH

   C. SOURCE - SWITCH - LAMP - SWITCH

   ALL WIRE INSULATION SHOULD BE PROPERLY PREPARED AND ALL CONNECTIONS MADE ACCORDING TO SAFE GROUNDING AND POLARIZED WIRING PROCEDURES.

B. INSTRUCTIONAL AREAS

1. USING ELECTRICAL SYMBOLS TO DIAGRAM WIRING CIRCUITRY

   A. FUSE

   B. DUPLEX OUTLET

   C. SWITCH

D. LAMP

E. CONDUCTORS

  (1) HOT CONDUCTORS
  (2) NEUTRAL CONDUCTORS
  (3) GROUNDING CONDUCTORS

2. SELECTING TOOLS FOR WIRING (REFER TO EQUIPMENT LIST IN THIS UNIT)

3. CONSTRUCTING A CIRCUIT

A. PREPARING A MATERIALS LIST

  (1) DETERMINING NUMBER AND SIZE OF BOXES

    (A) SWITCHES
    (B) OUTLETS
    (C) JUNCTION

  (2) DETERMINING THE TYPE OF CABLE

    (A) NM
    (B) NMC
    (C) UF
    (D) AC

  (3) DETERMINING LENGTH OF CABLE

    (A) DISTANCE BETWEEN BOXES
    (B) 7" AT EACH BOX

  (4) ACCESSORY FASTENERS

B. LOCATING THE PLACEMENT OF JUNCTION AND SWITCH OUTLET BOXES

C. SECURING THE BOXES

  (1) SURFACE MOUNTS
  (2) FLUSH MOUNT

    (A) OLD WORK - COMPRESSION TABS, HOLD-IT TABS
    (B) NEW OR EXPOSED WORK

  (3) CEILING MOUNT

D. PREPARING THE BOXES FOR CABLE CONNECTIONS

  (1) REMOVING APPROPRIATE KNOCKOUTS WITH SCREWDRIVER AND PLIERS

(2) INSTALLING BOX CONNECTORS

E. PREPARING THE CABLE OR CORD FOR CONNECTION TO BOXES

(1) CUTTING CABLE THE LENGTH BETWEEN BOXES PLUS 15'
(2) REMOVING 6" OF OUTER INSULATION COVER WITH KNIFE OR CABLE RIPPER
(3) REMOVING 1" OF WIRE INSULATION WITH WIRE STRIPPER

F. MAKING CONNECTIONS AT THE BOXES

(1) ATTACHING CABLE TO THE BOX
(2) ATTACHING GROUND WIRES

(A) USE OF GROUNDING SCREWS
(B) USE OF THE GROUNDING CLIPS

(3) POLARIZING CONDUCTOR CONNECTIONS

(A) HOT LINES - ALL COLORS BUT GREEN AND WHITE - BRASS-COLORED TERMINAL
(B) NEUTRAL - WHITE - SILVER-COLORED TERMINALS
(C) GROUNDING - GREEN OR BARE - GREEN-COLORED OR HEX HEAD TERMINALS

(4) USING SOLDERLESS CONNECTORS FOR WIRE CONNECTIONS

(A) RUBBER OR PLASTIC
(B) BAKELITE

(5) MAKING CONNECTIONS AT A TOGGLE SWITCH

(A) FORMING RIGHT HAND LOOPS FOR HOT CONDUCTOR TERMINAL ATTACHMENTS
(B) SPLICING OR CONNECTING NEUTRAL CONDUCTORS
(C) ATTACHING GROUNDING WIRE SO CIRCUIT HAS CONTINUOUS GROUND
(D) POSITIONING SWITCH IN BOX AND SECURING SWITCH AND THE COVER PLATE

(6) MAKING CONNECTIONS AT A LAMP RECEPTACLE

(A) PREPARING CONDUCTORS FOR ATTACHMENTS AT TERMINALS
(B) CONNECTING CONDUCTORS SO THE CIRCUIT IS POLARIZED AND IN PARALLEL
(C) ATTACHING THE GROUNDING WIRE SO ALL METAL BOXES ARE SECURELY GROUNDED
(D) POSITIONING RECEPTACLE AND SECURING IT TO THE BOX

- (7) MAKING CONNECTIONS AT A DUPLEX OUTLET
    - (A) UNSWITCHED HOT RECEPTACLE
    - (B) SWITCHED RECEPTACLE
    - (C) TWO CIRCUIT RECEPTACLES (SPLIT CIRCUIT)
    - (D) INSTALLATION IN EXISTING CIRCUITS

4. CONTROLLING CIRCUITS WITH 3-WAY SWITCHES

- A. FUNCTIONS OF 3-WAY SWITCHES
- B. IDENTIFYING SWITCHES AS TO TYPE
    - (1) SIDE-CONNECTED
    - (2) FRONT-CONNECTED
- C. INSTALLING 3-WAY SWITCHES
    - (1) PLANNING THE SWITCHING RUNS
        - (A) SOURCE - SWITCH - SWITCH - LIGHT
        - (B) SOURCE - SWITCH - LIGHT - SWITCH
        - (C) SOURCE - LIGHT - SWITCH - SWITCH
    - (2) SELECTION OF MATERIALS
    - (3) DETERMINING THE BEST PLACEMENT OF SWITCH BOXES
    - (4) PREPARING AND PLACING CABLES
        - (A) ATTACHING SWITCH-LEG WIRES
        - (B) ATTACHING CROSSOVER WIRES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS BUILD A PANEL OR MOUNTING BOARD APPROXIMATELY 15" X 30" OF PLYWOOD OR SOFT PINE WITH 1 PIECE OF 2 X 4 LUMBER, EACH 15" LONG, INSTALLED ON 18" SPACING ON THE REAR TO SIMULATE A SMALL AREA OF WALL. HAVE STUDENTS PLAN A SIMPLE LIGHT CIRCUIT CONTROLLED BY A SINGLE-POLE, SINGLE-THROW TOGGLE SWITCH. PRACTICE INSTALLATION SKILLS ON THE BOARD IN THE SHOP AND THEN MAKE ARRANGEMENTS FOR EACH STUDENT TO MAKE AN INSTALLATION IN AN ACTUAL BUILDING STRUCTURE. SKILLS SHOULD BE DEVELOPED ON A SOURCE-SWITCH-LIGHT ARRANGEMENT AND ALSO A SOURCE-LIGHT-SWITCH ARRANGEMENT.

2. USING A MOUNTING BOARD SUGGESTED IN THE FIRST ACTIVITY, HAVE STUDENTS SIMULATE INSTALLATION ARRANGEMENTS FOR TWO DUPLEX RECEPTACLES AND A SINGLE-POLE, SINGLE-THROW TOGGLE SWITCH. COMPETENCIES SHOULD BE DEVELOPED FOR ONE DUPLEX SWITCHED AND THE OTHER UNSWITCHED. EACH STUDENT SHOULD THEN MAKE AN INSTALLATION IN AN ACTUAL BUILDING STRUCTURE.

3. HAVE THE STUDENTS USE THE MOUNTING BOARD SUGGESTED IN THE FIRST ACTIVITY AND, AFTER PLANNING 3-WAY SWITCH ARRANGEMENTS, PRACTICE INSTALLATION OF THE CIRCUITRY ON THE BOARD WITH THREE PHYSICAL ORDERS: SOURCE-SWITCH-SWITCH-LIGHT; SOURCE-SWITCH-LIGHT-SWITCH; AND SOURCE-LIGHT-SWITCH-SWITCH. FOLLOW UP INSTALLATIONS WITH AT LEAST ONE OF THE ORDERS BEING MADE BY EACH STUDENT IN AN ACTUAL BUILDING STRUCTURE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EACH STUDENT SHOULD BE EVALUATED WITH A PAPER AND PENCIL TEST OF IDENTIFYING NAMES FOR THE PARTS AND MATERIALS USED IN A SIMPLE LIGHT CIRCUIT INSTALLATION. HE SHOULD BE ASKED TO CORRECTLY DESCRIBE POLARIZATION - WHAT IT IS AND HOW THE COLOR OF MATERIALS IS USED TO AID IN CORRECTLY POLARIZING INSTALLATIONS. HE SHOULD DESCRIBE GROUNDING - ITS PURPOSE AND HOW IT SHOULD BE USED IN CIRCUIT INSTALLATIONS. HE SHOULD ALSO INSTALL A SIMPLE SWITCH-CONTROLLED LIGHTING CIRCUIT, DEMONSTRATING PROPER PREPARATION OF CONDUCTORS, SOUND CONNECTIONS, AND WITH PROPER POLARIZATION AND GROUNDING.

2. EACH STUDENT SHOULD COMPLETE AN INSTALLATION OF A CIRCUIT CONTAINING A SWITCH AND TWO DUPLEX RECEPTACLES. EITHER ON A MOUNTING OR ACTUAL BUILDING INSTALLATION, THE STUDENT SHOULD BUILD THE CIRCUIT SO THAT ONE DUPLEX RECEPTACLE IS CONTROLLED BY THE SWITCH AND THE OTHER ONE IS CONTINUOUSLY HOT. THE INSTALLATION SHOULD SHOW PROPER PREPARATION OF THE CONDUCTORS, CONNECTIONS WHICH ARE POLARIZED AND SOUNDLY ATTACHED WITH PROPER GROUNDING CONNECTIONS MADE.

3. EACH STUDENT SHOULD DEMONSTRATE ABILITY TO INSTALL EACH OF THE THREE ARRANGEMENTS FOR THREE-WAY SWITCH CIRCUITRY ON A MOUNTING BOARD OR AT LEAST ONE TYPE OF ARRANGEMENT IN AN ACTUAL BUILDING INSTALLATION. THE STUDENT SHOULD BE EVALUATED UPON THE CORRECT POLARIZATION AND ALL CONDUCTORS BEING CORRECTLY PREPARED AND FIRMLY ATTACHED.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MOUNTING BOARD (PLUS SCREWS FOR ASSEMBLING), CORD WITH MALE PLUG, ROMEX BOX CONNECTORS, HANDY BOXES, SOLDERLESS CONNECTORS, TOGGLE SWITCHES (2-WAY AND 3-WAY), DUPLEX RECEPTACLES, BLACK ELECTRICAL TAPE OR BLACK MAGIC MARKER, GROUNDING SCREWS OR CLIPS

2. TOOLS - SCREWDRIVERS, KNIFE AND CABLE RIPPER, WIRE STRIPPER, NEEDLE NOSE OR ROUND NOSE PLIERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. MAINTAINING THE LIGHTING AND WIRING SYSTEM. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1974, 80 PAGES.

   AS ITS NAME IMPLIES, THIS REFERENCE IS MAINLY ABOUT THE MAINTENANCE ASPECT OF LIGHTING AND WIRING SYSTEMS. COLORED ILLUSTRATIONS ARE USED TO AID UNDERSTANDING OF STEP-BY-STEP PROCEDURES USED TO PRESENT MAINTENANCE ACTIVITIES.

2. NATIONAL ELECTRICAL CODE 1971. BOSTON, MASSACHUSETTS: NATIONAL FIRE PROTECTION ASSOCIATION. 1971, 536 PAGES.

   THE CODE IS AN ADVISORY PRESENTATION OF SAFE PRACTICES FOR ELECTRICAL INSTALLATIONS. WHILE THE CODE HAS NO LEGAL POWER OR CONTROL, IT IS OFTEN USED BY LAW AS A STANDARD FOR REGULATORY PURPOSES IN THE INTEREST OF LIFE AND PROPERTY PROTECTION. THE PRESENTATION GIVES THE "WHAT" AND "HOW" OR WIRING BUT IS NOT INTENDED TO PROVIDE THE "WHY." THE NATIONAL ELECTRICAL CODE IS PERIODICALLY UPDATED AND THE NATIONAL ELECTRICAL CODE 1974 IS SCHEDULED FOR PUBLICATION IN SEPTEMBER OF 1974 BECOMING EFFECTIVE EARLY IN 1975.

3. NFPA HANDBOOK OF THE NATIONAL ELECTRICAL CODE. 3RD EDITION. NEW YORK, NEW YORK: MC GRAW-HILL BOOK COMPANY. 1972, 748 PAGES.

   THIS NATIONAL FIRE PROTECTION ASSOCIATION HANDBOOK INCLUDES A VERBATIM REPRODUCTION OF THE OFFICIAL 2972 NATIONAL ELECTRICAL CODE, PLUS COMMENTS, DIAGRAMS AND ILLUSTRATIONS TO AID IN UNDERSTANDING THE CODE WHERE NECESSARY OR CONSIDERED DESIRABLE.

4. RICHTER, H. P. WIRING SIMPLIFIED. 30TH EDITION. MINNEAPOLIS, MINNESOTA: PARK PUBLISHING, INC. 1971, 144 PAGES.

   THIS REFERENCE IS BASED ON THE NATIONAL ELECTRICAL CODE 1971 AND BRINGS OUT "WHY" THINGS ARE DONE IN A PARTICULAR WAY. MANY OF THE ELECTRICAL INSTALLATIONS THAT CAN BE MADE BY HOMEOWNERS AND SMALL BUSINESS OPERATIONS ARE DESCRIBED AND ILLUSTRATED SO THAT THE FINISHED JOB WILL BE PRACTICAL AND SAFE.

5. SIMPLIFIED ELECTRIC WIRING HANDBOOK. CHICAGO, ILLINOIS: SEARS, ROEBUCK AND COMPANY. 1964, 55 PAGES.

THIS REFERENCE IS A WELL-ILLUSTRATED STEP-BY-STEP PRESENTATION OF PLANNING AND INSTALLING MANY TYPES OF ELECTRICAL CIRCUITS AND DEVICES. SPECIFIC WIRING TECHNIQUES ARE GIVEN FOR MANY OF THE COMMON INSTALLATION PROCESSES.

PLANNING AND INSTALLING THE MAIN SERVICE ENTRANCE

UNIT CONCEPT: THE MAIN SERVICE ENTRANCE INCLUDES DEVICES WHICH PROVIDE OVERCURRENT PROTECTION TO EACH OF THE CIRCUITS AND PROVIDE A MEANS TO GROUND THE SYSTEM TO REDUCE SHOCK HAZARDS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR A SERVICE ENTRANCE INSTALLATION, DESCRIBE THE EXTENT OF RESPONSIBILITY FOR INSTALLING THE SYSTEM WHICH BELONGS TO THE POWER SUPPLIER AND THAT WHICH BELONGS TO THE CUSTOMER ACCORDING TO LOCAL POWER SUPPLIER POLICY.

2. FOR A GIVEN PROPOSED INSTALLATION, PLAN THE SERVICE ENTRANCE FACILITIES WHICH WOULD PROVIDE: (1) A BALANCED LOAD DISTRIBUTION, (2) A MAXIMUM OF 2% VOLTAGE DROP IN THE FEEDERS, AND (3) ADEQUATE OVERHEAD SUPPORT AND HEIGHT OF FEEDER WIRES ACCORDING TO APPROPRIATE ELECTRICAL STANDARDS.

3. WHEN PROVIDED WITH LABORATORY MOCK-UP EQUIPMENT OR AN ON-SITE INSTALLATION, MAKE CONNECTIONS WHICH ARE POLARIZED AND SECURELY FASTENED FOR: (1) SERVICE ENTRANCE CONDUCTORS TO A FUSE-TYPE AND CIRCUIT BREAKER BOX, (2) GROUNDING THE SYSTEM BY BOTH A GROUND ROD AND A COLD WATER PIPE, AND (3) BRANCH CIRCUITS TO A FUSE-TYPE AND A CIRCUIT BREAKER BOX.

4. FOR A GIVEN ENTRANCE BOX, SELECT AND INSTALL THE PROTECTIVE DEVICES OF THE TYPE AND AMPACITY TO ADEQUATELY PROTECT THE TYPE OF CIRCUITS ACCORDING TO THE NATIONAL ELECTRICAL CODE.

B. INSTRUCTIONAL AREAS

1. DEFINING THE EXTENT OF THE POWER SUPPLIER'S RESPONSIBILITY IN PROVIDING AND INSTALLING ELECTRICAL SERVICE

2. PLANNING THE MAIN SERVICE ENTRANCE

   A. LOCATING THE METER AND MAIN SERVICE ENTRANCE

      (1) BUILDING LOCATION
      (2) CENTRAL POLE

B. INSTALLING FEEDER WIRES

(1) SELECTING FOR MAXIMUM OF 1% VOLTAGE DROP
(2) PROVIDING ADEQUATE CLEARANCE ABOVE GROUND
(3) SECURING FEEDERS TO SERVICE ENTRANCE INSTALLATION

3. CONNECTING SERVICE ENTRANCE CONDUCTORS TO A MAIN CIRCUIT BREAKER SWITCH

4. CONNECTING SERVICE ENTRANCE CONDUCTORS TO A MAIN SWITCH OF A FUSE BOX

5. GROUNDING THE SYSTEM AT THE SERVICE ENTRANCE

A. USE OF A COLD WATER PIPE

(1) DETERMINING ADEQUATE METAL-TO-GROUND CONTACT
(2) USING "JUMPER" WIRE AT METERS

B. USE OF A GROUND ROD

6. PROVIDING STAND-BY OR EMERGENCY GENERATION AT THE SERVICE ENTRANCE

A. THE IMPORTANCE OF STAND-BY GENERATION TO MODERN AGRICULTURAL OPERATIONS

B. TYPES OF STAND-BY GENERATING EQUIPMENT

(1) STATIONARY ENGINE-DRIVEN

(A) AUTOMATIC
(B) NON-AUTOMATIC

(2) TRACTOR-DRIVEN

C. PROVIDING A DOUBLE-POLE, DOUBLE-THROW SWITCH TO PREVENT UNWANTED CHARGING OF LINES

7. SELECTING TYPES OF ENTRANCE BOXES AND SWITCHES

A. MANUAL - NONFUSIBLE

B. MANUAL FUSIBLE

C. CIRCUIT BREAKER

8. SELECTING AMPERAGE RATING FOR ELECTRICAL NEEDS

9. CONNECTING BRANCH CIRCUITS TO THE CIRCUIT BREAKER ENTRANCE BOX

- A. FOLLOWING SAFE PROCEDURES
- B. CONNECTING THE NEUTRAL AND GROUNDING WIRES
- C. CONNECTING THE HOT WIRES (FUSE AND LOAD IN SERIES)
- D. INSTALLING CIRCUIT BREAKERS SO THAT LOADS ARE BALANCED ON INCOMING SERVICE ENTRANCE HOT CONDUCTORS

10. CONNECTING BRANCH CIRCUITS TO THE FUSE BOX
    - A. FOLLOWING SAFE PROCEDURES
    - B. CONNECTING NEUTRAL AND GROUNDING WIRES
    - C. CONNECTING THE HOT WIRES (FUSE AND LOAD IN SERIES)
    - D. BALANCING THE LOAD ON THE INCOMING SERVICE ENTRANCE HOT CONDUCTORS
11. IDENTIFYING CHARACTERISTICS OF CIRCUIT PROTECTION DEVICES
    - A. FUSES
        - (1) PLUG FUSES
            - (A) COMMON
            - (B) FUSETRON
            - (C) FUSTAT
            - (D) PUSH BUTTON RESET
        - (2) CARTRIDGE FUSE
            - (A) RENEWABLE LINK
            - (B) DELAY LINK
            - (C) STANDARD
            - (D) BLADE
            - (E) TYPE SC
        - (3) CIRCUIT BREAKERS
            - (A) THERMAL TYPES
            - (B) MAGNETIC TYPES
        - (4) GROUND FAULT INTERRUPTER
12. SELECTING CIRCUIT PROTECTIVE DEVICES
    - A. DETERMINING THE AMPACITY OF THE CONDUCTORS
    - B. SELECTING A TYPE TO FIT THE RECEPTACLE

C. DETERMINING THE NEED FOR TIME DELAY DEVICES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS VISIT SEVERAL TYPES OF INSTALLATIONS AND HAVE THE POWER SUPPLIER POINT OUT THE PARTS OF THE SERVICE WHICH ARE THE RESPONSIBILITY OF THE POWER SUPPLIER AND THOSE THAT ARE THE RESPONSIBILITY OF THE CUSTOMER. HAVE EACH STUDENT MAKE A DIAGRAM OF THE INSTALLATIONS AND COLOR CODE THE PARTS WHICH ARE THE RESPONSIBILITY FOR EACH PARTY.

2. HAVE STUDENTS WORK IN COMMITTEES OF THREE. AFTER BEING GIVEN AN INSTALLATION SITUATION, HAVE ONE STUDENT PREPARE A REPORT OF HOW THE SERVICE ENTRANCE WOULD BE PLANNED TO BALANCE THE LOAD DISTRIBUTION, THE SECOND STUDENT REPORT ON SIZE AND TYPE OF FEEDERS TO PROVIDE A MAXIMUM 1% VOLTAGE DROP, AND THE THIRD STUDENT REPORT ON HOW FEEDERS WOULD BE PLACED SO THAT OVERHEAD SPANS ARE ADEQUATELY SUPPORTED AT HEIGHTS MEETING CODE REQUIREMENTS.

3. HAVE EACH STUDENT USE LABORATORY EQUIPMENT TO CONSTRUCT A MOCK-UP OF THE CONNECTIONS AT THE SERVICE ENTRANCE BOX PROVIDING THE SERVICE ENTRANCE CONDUCTORS, GROUNDING AND BRANCH CIRCUIT CONNECTIONS.

4. HAVE STUDENTS PREPARE A DISPLAY OF THE VARIOUS TYPES OF CIRCUIT PROTECTIVE DEVICES WITH A VISUAL DEPICTION OF THE SPECIAL CHARACTERISTICS AND APPLICATION OF EACH. PLAN THAT A COMMITTEE OR SELECTED STUDENTS PREPARE A PRESENTATION OF THIS DISPLAY TO GIVE TO SCIENCE CLASSES. A MAJOR OBJECTIVE WOULD BE TO DEMONSTRATE THE FUNCTION OF PROTECTIVE DEVICES AND RATIONALE FOR SELECTING PROPER PROTECTIVE DEVICES.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A DIAGRAM OF A TYPICAL SERVICE ENTRANCE INSTALLATION SHOULD BE PROVIDED AND THE STUDENT IDENTIFY THE COMPONENTS WHICH ARE THE RESPONSIBILITY OF THE POWER SUPPLIER AND THOSE THAT ARE OF THE CUSTOMER ACCORDING TO LOCAL POWER COMPANY POLICY.

2. A PLAN CAN BE PROVIDED WHICH SHOWS LOCATION OF FARM BUILDING AND ELECTRICAL LOADS IN EACH. THE STUDENT SHOULD LOCATE THE APPROXIMATE ELECTRICAL LOAD CENTER POINT AND BY THE USE OF AMPACITY CHARTS DETERMINE THE SIZE OF FEEDERS TO USE WHICH WOULD PROVIDE A MAXIMUM OF 1% VOLTAGE DROP.

3. EACH STUDENT SHOULD DO A MINIMUM OF ONE ELECTRICAL CONNECTION PROJECT DEMONSTRATING CORRECT PREPARATION OF THE CABLE, POLARIZED AND TIGHT CONNECTIONS ON EACH OF THE FOLLOWING:

   A. SERVICE ENTRANCE CONNECTION TO A FUSE BOX

   B. SERVICE ENTRANCE CONNECTION TO A CIRCUIT BREAKER BOX

   C. GROUNDING ON A WATER PIPE

   D. GROUNDING ON A GROUNDING ROD

   E. BRANCH CIRCUIT CONNECTION TO A FUSE BOX

   F. BRANCH CIRCUIT CONNECTION TO A CIRCUIT BREAKER BOX

4. FROM A DIAGRAM OR SPECIMEN OF THE VARIOUS FUSES AND CIRCUIT BREAKERS USED IN HOMES AND SMALL BUSINESS, IDENTIFY AND WRITE A SHORT DESCRIPTION OF THE CHARACTERISTICS AND MAJOR USE OF EACH.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CIRCUIT BREAKER BOXES, FUSE BOXES, ASSORTMENT OF TYPES AND SIZES OF CIRCUIT BREAKERS AND FUSES

2. CABLE TO MAKE SERVICE ENTRANCE CONNECTIONS, BRANCH SERVICE CONNECTIONS AND GROUND WIRE

3. PIPE OR ROD FOR GROUNDING ROD, CLAMPS FOR GROUNDING ROD AND WATER PIPE CONNECTIONS

4. WIRE CUTTING AND STRIPPING TOOLS, SCREWDRIVERS, PLIERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL WIRING HANDBOOK. NEW YORK, NEW YORK: AGRICULTURAL MARKETING DIVISION, EDISON ELECTRIC INSTITUTE 1971, 75 PAGES.

   THIS BOOK IS DEVOTED ENTIRELY TO FARM WIRING. IT IS WRITTEN AS A BOOK ON HOW TO PLAN WIRING RATHER THAN BEING CONCERNED WITH TYPES OF MATERIALS OR METHODS OF WIRING. IT GENERALLY CONSISTS OF RECOMMENDATIONS AND SUGGESTIONS FOR SIZES OF CONDUCTORS, NUMBER AND LOCATION OF OUTLETS AND SIMILAR FACTORS FOR VARIOUS LIVESTOCK, POULTRY AND CROP OPERATIONS IN ADDITION TO RESIDENTIAL SPECIFICATIONS.

2. *NATIONAL ELECTRICAL CODE 1971*. BOSTON, MASSACHUSETTS: NATIONAL FIRE PROTECTION ASSOCIATION. 1971, 536 PAGES.

THE CODE IS AN ADVISORY PRESENTATION OF SAFE PRACTICES FOR ELECTRICAL INSTALLATIONS. WHILE THE CODE HAS NO LEGAL POWER OR CONTROL, IT IS OFTEN USED BY LAW AS A STANDARD FOR REGULATORY PURPOSES IN THE INTEREST OF LIFE AND PROPERTY PROTECTION. THE PRESENTATION GIVES THE "WHAT" AND "HOW" OF WIRING BUT IS NOT INTENDED TO PROVIDE THE "WHY." THE *NATIONAL ELECTRICAL CODE* IS PERIODICALLY UPDATED AND THE *NATIONAL ELECTRICAL CODE 1974* IS SCHEDULED FOR PUBLICATION IN SEPTEMBER OF 1974 BECOMING EFFECTIVE EARLY IN 1975.

3. RICHTER, H. P. *WIRING SIMPLIFIED*. 30TH EDITION. MINNEAPOLIS, MINNESOTA: PARK PUBLISHING, INC. 1974, 144 PAGES.

THIS REFERENCE IS BASED ON THE *NATIONAL ELECTRICAL CODE 1971* AND BRINGS OUT "WHY" THINGS ARE DONE IN A PARTICULAR WAY. MANY OF THE ELECTRICAL INSTALLATIONS THAT CAN BE MADE BY HOMEOWNERS AND SMALL BUSINESS OPERATIONS ARE DESCRIBED AND ILLUSTRATED SO THAT THE FINISHED JOB WILL BE PRACTICAL AND SAFE.

4. *SIMPLIFIED ELECTRIC WIRING HANDBOOK*. CHICAGO, ILLINOIS: SEARS, ROEBUCK AND COMPANY. 1964, 55 PAGES.

THIS REFERENCE IS A WELL-ILLUSTRATED STEP-BY-STEP PRESENTATION OF PLANNING AND INSTALLING MANY TYPES OF ELECTRICAL CIRCUITS AND DEVICES. SPECIFIC WIRING TECHNIQUES ARE GIVEN FORM MANY OF THE COMMON INSTALLATION PROCESSES.

ELECTRIC MOTORS - SELECTION AND MAINTENANCE

UNIT CONCEPT: SELECTING A MOTOR ACCORDING TO THE EXPECTED OPERATING LOAD AND ENVIRONMENTAL CONDITIONS IS IMPORTANT TO THE MOTOR PERFORMING ITS WORK EFFECTIVELY, EFFICIENTLY AND SAFELY OVER A LONG PERIOD OF YEARS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR THE VARIOUS TYPES OF MOTORS, PROVIDE MAINTENANCE SERVICES WHICH ARE RECOMMENDED TO KEEP MOTORS IN A SAFE AND EFFICIENT OPERATING CONDITION.

2. USING A DUAL VOLTAGE, REVERSIBLE MOTOR, CORRECTLY CHANGE THE VOLTAGE AND DIRECTION OF THE MOTOR ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

3. USING A CHART OF MOTOR TYPES AND CHARACTERISTICS, SELECT A MOTOR WHICH FITS ITS JOB IN THE FOLLOWING CHARACTERISTICS:

    A. MOTOR TYPE

    B. STARTING LOAD

    C. HORSEPOWER

    D. MOTOR SPEED

    E. MOTOR DUTY

    F. MOTOR BEARINGS

    G. MOTOR ENCLOSURE

    H. MOTOR MOUNTING

4. FOR A GIVEN PIECE OF EQUIPMENT TO BE POWERED BY AN ELECTRIC MOTOR, SELECT THE KIND AND SIZE OF DRIVE WHICH WILL OPERATE THE EQUIPMENT WITHIN THE RECOMMENDED SPEEDS.

5. FOR A GIVEN MOTOR AND POWER APPLICATION, SELECT AN OVERLOAD PROTECTION DEVICE ACCORDING TO THE STANDARDS OF THE NATIONAL ELECTRICAL CODE.

B. INSTRUCTIONAL AREAS

1. DEFINING THE ADVANTAGES OF ELECTRIC MOTORS TO PROVIDE FARM POWER
    - A. RELIABILITY
    - B. REMOTE CONTROL
    - C. VARIABLE POWER SIZE TO FIT MANY JOBS
    - D. ADAPTABLE TO MANY ENVIRONMENTAL CONDITIONS
    - E. COST OF OPERATING
2. MAINTAINING MOTORS
    - A. CLEANING DUST AND FOREIGN MATERIALS FROM MOTORS
    - B. LUBRICATING MOTORS ACCORDING TO THEIR NEEDS
        - (1) SLEEVE BEARINGS
        - (2) BALL BEARINGS
    - C. PROTECTING MOTORS FROM DUST, DIRT AND SPLASHING
    - D. CHECKING AND REPLACING WORN CORDS
    - E. CHECKING AND REPLACING WORN BEARINGS
    - F. CHANGING WORN BRUSHES
3. ADJUSTING MOTORS FOR SPECIFIC USES
    - A. CHANGING VOLTAGE SETTING OF DUAL/VOLTAGE MOTORS
    - B. CHANGING DIRECTION OF TURNING
4. SELECTING MOTORS ACCORDING TO THEIR USE
    - A. DETERMINING THE MOTOR TYPE OR DESIGN FOR THE REQUIRED STARTING LOADS
        - (1) THREE-PHASE
        - (2) SINGLE PHASE
            - (A) EASY STARTING LOADS
                - 1. SHADED - POLE INDUCTION
                - 2. SPLIT - PHASE
                - 3. PERMANENT - SPLIT, CAPACITOR - INDUCTOR
                - 4. SOFT - START

- (B) DIFFICULT STARTING LOADS
    1. CAPACITOR - START, INDUCTION RUN
    2. REPULSION - START, INDUCTION RUN
    3. CAPACITOR - START, CAPACITOR RUN
    4. REPULSION - START, CAPACITOR RUN
    5. THREE-PHASE - GENERAL PURPOSE

B. DETERMINING THE APPROPRIATE HORSEPOWER RATING

- (1) MATCHING THE MOTOR TO EQUIPMENT POWER NEEDS
    - (A) REPLACING SMALL PORTABLE INTERNAL COMBUSTION ENGINES
    - (B) REPLACING INDUSTRIAL-TYPE INTERNAL COMBUSTION ENGINES
    - (C) REPLACING POWER OF A TRACTOR PTO SHAFT
    - (D) INSTALLING MOTORS ON NEW EQUIPMENT
- (2) FOLLOWING THE REGULATIONS ON SIZE OF MOTORS BY POWER SUPPLIERS
    - (A) SINGLE-PHASE, 120 OR 240 VOLTS
    - (B) THREE-PHASE, 240 VOLTS OR MORE
- (3) MATCHING THE MOTOR SIZE TO THE SERVICE ENTRANCE

C. DETERMINING THE APPROPRIATE MOTOR SPEED

- (1) NO LOAD SPEEDS 3600, 1800 AND 1200 TO MATCH EQUIPMENT OPERATING SPEEDS
- (2) PULLEY-AND-BELT
- (3) GEARS
- (4) CHAIN-AND-SPROCKET

D. DETERMINING THE APPROPRIATE MOTOR DUTY

- (1) CONTINUOUS DUTY
- (2) INTERMITTENT DUTY

E. DETERMINING THE APPROPRIATE MOTOR BEARINGS

- (1) METHOD AND FREQUENCY OF LUBRICATION
- (2) MOTOR-MOUNTING POSITION

F. DETERMINING THE APPROPRIATE MOTOR ENCLOSURE

- (1) DRIP-PROOF
- (2) SPLASH-PROOF
- (3) TOTALLY ENCLOSED

G. DETERMINING THE APPROPRIATE MOTOR MOUNTING

(1) RIGID BASE

(A) ADJUSTING SCREWS
(B) SLIDING BASE OR RAILS

(2) CUSHIONED BASE

5. SELECTING MOTOR DRIVES

A. DETERMINING THE TYPE OF DRIVE FOR A SPECIFIC APPLICATION

(1) TYPES AND CAHRACTERISTICS OF DIRECT DRIVES
(2) TYPES AND CHARACTERISTICS OF SPEED-CONVERSION DRIVES

B. DETERMINING THE SIZE OF DIRECT DRIVE BY HORSEPOWER

C. DETERMINING THE SIZE OF PULLEY-AND-BELT DRIVES

(1) REQUIRED SPEED OF THE DRIVEN EQUIPMENT
(2) SIZE AND NUMBER OF BELTS TO DELIVER THE HORSEPOWER

D. DETERMINING THE LENGTHS OF V-BELTS NEEDED

6. SELECTING MOTOR OVERLOAD PROTECTION DEVICES

A. TYPES OF OVERLOAD PROTECTION DEVICES AND HOW THEY WORK

(1) BUILT-IN OVERLOAD PROTECTION IN THE MOTOR
(2) MANUAL STARTING SWITCH WITH OVERLOAD PROTECTION
(3) MAGNETIC STARTING SWITCH WITH OVERLOAD PROTECTION
(4) TIME-DELAY FUSE IN MOTOR-DISCONNECT SWITCH
(5) CURRENT-LIMITING (RESISTOR) STARTER

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. OBTAIN MOTORS WHICH ARE IN NEED OF MAINTENANCE OR REPAIR. THERE SHOULD BE AT LEAST ONE PER STUDENT AND THEY SHOULD COVER AS WIDE A RANGE OF SIZES AND TYPES AS POSSIBLE WITHIN THE TYPE TO BE TAUGHT IN THE COURSE. IN ADDITION TO STUDENTS BRINGING MOTORS FROM HOME, ELECTRICAL REPAIR SHOPS ARE A SOURCE, ESPECIALLY OF OUT-OF-SERVICE MOTORS. MAKE RECORDS OF THE MOTOR CONDITIONS BEFORE BEGINNING WORK ON THEM IN REGARDS TO RUNNING AND OVERALL APPEARANCES. DISASSEMBLE AND INSPECT THE MOTORS, AGAIN NOTING

ANY PROBLEMS. CLEAN INNER PARTS AND STUDY THE MOTOR COMPONENTS AND THEIR FUNCTIONS. CHECK TYPE OF BEARINGS, LUBRICATE AND CONSIDER REPLACEMENT OF BEARING IF NEEDED. CHECK BRUSHES AND ALL TERMINAL CONNECTIONS AND CONDUCTORS. REASSEMBLE.

2. HAVE EACH STUDENT IN THE CLASS USE A DUAL VOLTAGE MOTOR AND CHANGE THE VOLTAGE FROM 120 TO 240 VOLTS AND VICE VERSA ACCORDING TO THE SCHEMATIC DIAGRAM. EACH STUDENT USE A REVERSIBLE MOTOR AND CHANGE THE DIRECTION OF THE DRIVE BY PROPER CHANGE OF CONDUCTORS.

3. TAKE A FIELD TRIP TO A FARM WHERE LARGE NUMBERS AND TYPES OF ELECTRIC MOTORS ARE USED. ASSIGN STUDENTS TO PARTICULAR MOTORS FOR THE PURPOSE OF DEFINING THE CHARACTERISTICS OF THE MOTOR INCLUDING:

   A. MOTOR TYPE
   B. STARTING LOAD
   C. HORSEPOWER
   D. MOTOR SPEED
   E. MOTOR DUTY
   F. TYPE OF BEARING
   G. MOTOR ENCLOSURE
   H. MOTOR MOUNTING

   AFTER INSPECTING THE MOTOR FOR THE ABOVE CHARACTERISTICS, HAVE EACH STUDENT DESCRIBE "HIS" MOTOR TO THE CLASS AND DISCUSS THE COMPATIBILITY OF THE MOTOR FOR THE JOB AND WORKING CONDITIONS.

4. ASSIGN PAIRS OF STUDENTS TO AN ELECTRIC MOTOR AND A PIECE OF EQUIPMENT TO BE DRIVEN BY THE MOTOR AT A SPEED OTHER THAN THE MOTOR SPEED. HAVE STUDENTS CALCULATE THE SIZE OF PULLEYS NEEDED TO OBTAIN THE RECOMMENDED SPEED OF THE PIECE OF EQUIPMENT. CHECK THE ACCURACY OF THEIR DECISION BY INSTALLING THE PULLEYS AND CHECKING EQUIPMENT SPEED WITH A HAND TACHOMETER.

5. PREPARE A BULLETIN BOARD DISPLAY OR SHOP DISPLAY WHICH SHOWS THE TYPE OF PROTECTIVE DEVICES FOR MOTORS AND HOW EACH MAY BE USED FOR MOTOR INSTALLATIONS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EACH STUDENT SHOULD BE ASSIGNED A MOTOR IN NEED OF CLEANING. THE MOTOR SHOULD BE CLEANED WHILE MAKING SURE THAT ALL DUST, DIRT AND GREASE IS REMOVED WITHOUT UNDUE CONTAMINATION OR SOAKING OF MOTOR COMPONENTS. THE STUDENT SHOULD USE PROPER LUBRICATING PROCEDURES AND DESCRIBE THE FREQUENCY THAT LUBRICATION SHOULD BE DONE ON A PARTICULAR MOTOR.

2. EACH STUDENT WITHOUT ASSISTANCE SHOULD PROPERLY CHANGE THE VOLTAGE LEVEL FROM 120 TO 240 AND VICE VERSA, AND MAKE THE ADJUSTMENTS TO CHANGE THE OPERATING DIRECTION OF A MOTOR.

3. PREPARE A LIST OF SIMULATED SITUATIONS FOR USING ELECTRIC MOTORS. USING A CHART (ONE CAN BE FOUND IN *ELECTRIC MOTORS - SELECTION, PROTECTION, DRIVES*. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1972. FIGURE 19.) WHICH DESCRIBES MOTOR CHARACTERISTICS INCLUDING:

   A. MOTOR TYPE

   B. STARTING LOAD CHARACTERISTICS

   C. HORSEPOWER

   D. MOTOR SPEED

   E. MOTOR DUTY

   F. MOTOR BEARINGS

   G. MOTOR ENCLOSURE

   H. MOTOR MOUNTING

   EACH STUDENT SHOULD MATCH UP MOTOR CHARACTERISTICS WHICH ARE APPROPRIATE FOR THE PROPOSED USE OF THE MOTOR.

4. EACH STUDENT SHOULD CALCULATE THE PULLEY SIZES NEEDED TO OPERATE A PIECE OF EQUIPMENT WITHIN THE RECOMMENDED SPEED. THIS CALCULATION SHOULD BE MADE FROM THE NAME PLATE INFORMATION REGARDING THE MOTOR SPEED AND FROM THE RECOMMENDED SPEED OF THE DRIVEN PIECE OF EQUIPMENT. THE STUDENT SHOULD ALSO BE EVALUATED UPON HIS CHOICE OF TYPES OF DRIVES AND THE METHOD OF ALIGNING.

5. USING A PAPER-PENCIL EVALUATION, PRESENT SEVERAL TYPES OF MOTOR INSTALLATIONS AND HAVE STUDENTS SELECT A MOTOR PROTECTION DEVICE WHICH IS WITHIN THE STANDARDS OF THE *NATIONAL ELECTRICAL CODE*.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. MOTORS OF VARYING TYPES AND SIZES - AT LEAST TWO TYPES OF MOTORS IN EACH CLASS; EASY-START AND DIFFICULT-START

2. PROTECTIVE DEVICES FOR MOTOR CIRCUITS

3. FLAT BELT AND V-BELT PULLEYS, V-BELTS

4. CLEANING MATERIALS RECOMMENDED BY MOTOR MANUFACTURERS (NONINFLAMABLE SOLVENT), BRUSHES, AIR COMPRESSOR, VACUUM CLEANER OR AIR PUMP

5. TACHOMETER

6. SCREWDRIVERS, PLIERS

F. EXAMPLES OF SUPPORTING REFERENCES

1. ELECTRIC MOTORS FOR AGRICULTURE - STUDENT AND TEACHER MANUALS. NEW YORK, NEW YORK: AGRICULTURAL MARKETING GROUP, EDISON ELECTRIC INSTITUTE. 1971, 73 PAGES.

   THE STUDENT MANUAL PRESENTS KNOW-HOW WITH THEORETICAL UNDERSTANDING OF ELECTRIC MOTORS. MAJOR STUDY AREAS INCLUDE AN INTRODUCTION TO ELECTRIC MOTORS; KINDS OF MOTORS; HOW MOTORS WORK; SELECTING A MOTOR; INSTALLING A MOTOR; AND PROTECTION, CONTROL AND MAINTENANCE. THE TEACHER'S GUIDE INCLUDES TEACHING OBJECTIVES, AIDS, PROCEDURES AND RESPONSES TO REVIEW QUESTIONS.

2. ELECTRIC MOTORS - LESSON PLANS FOR AGRICULTURAL PRODUCTION. AUSTIN, TEXAS: VOCATIONAL AGRICULTURAL EDUCATION DIVISION, TEXAS EDUCATION AGENCY. 1969, 102 PAGES.

   THIS REFERENCE IS A PRESENTATION OF THE CHARACTERISTICS OF VARIOUS TYPES OF MOTORS, MOTOR PROTECTION, MOTOR DRIVES AND MOTOR MAINTENANCE. IT IS ONE OF THE MORE DESCRIPTIVE REFERENCES ON CHANGING VOLTAGE AND DIRECTION OF THE MOTORS.

3. ELECTRIC MOTORS - SELECTION, PROTECTION, DRIVES. ATHENS, GEORGIA: ENGINEERING CENTER, AMERICAN ASSOCIATION FOR VOCATIONAL INSTRUCTIONAL MATERIALS. 1972, 56 PAGES.

   THIS REFERENCE IS WRITTEN FOR STUDENT STUDY IN REGARDS TO SELECTING MOTORS, PROTECTIVE DEVICES AND MOTOR-DRIVE MECHANISMS. THE TEXT IS COORDINATED WITH A WIDE SELECTION OF PHOTOGRAPHS AND COLORED ILLUSTRATIONS.

V

FARM BUSINESS MANAGEMENT

U.S.O.E. CODE 01.01 04 00 00

USING INVENTORIES AND DEPRECIATION SCHEDULES

KEEPING FARM ACCOUNTS

PREPARING FARM BUDGETS

SUMMARIZING FARM RECORDS

ANALYZING FARM RECORDS

REPLANNING THE FARM BUSINESS FROM RECORD ANALYSIS

FARM TAXATION

FARM INSURANCE

FARM LAW

FINANCING FARM OPERATIONS

SUPERVISING FARM LABOR FOR EFFICIENCY

PLANNING WORK SCHEDULES

HUMAN RELATIONS IN PERSONNEL MANAGEMENT

USING INVENTORIES AND DEPRECIATION SCHEDULES

UNIT CONCEPT: INVENTORIES AND DEPRECIATION SCHEDULES SHOULD BE SET UP WHEN A FARMER BEGINS A FARMING OPERATION. HE WILL NEED TO KNOW WHAT ITEMS HE HAS ON HAND SO HE CAN ANALYZE HIS RECORDS, IMPROVE HIS BUSINESS, AND CALCULATE DEPRECIATION FOR INCOME TAX PURPOSES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A PARTICULAR FARMING OPERATION AND CURRENT VALUE OF ITEMS, TAKE INVENTORY AND RECORD THESE ITEMS IN A RECORD BOOK ACCORDING TO RECOMMENDED PROCEDURES AND TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN GIVEN AN INVENTORY SCHEDULE FOR A SPECIFIC FARMING OPERATION, DETERMINE WHICH ITEMS SHOULD BE INCLUDED IN DEPRECIATION SCHEDULES TO THE SATISFACTION OF THE INSTRUCTOR.

3. WHEN GIVEN THE ITEMS TO BE INCLUDED IN A DEPRECIATION SCHEDULE FOR A FARMING OPERATION, SET UP A DEPRECIATION SCHEDULE AND CORRECTLY CALCULATE DEPRECIATION BY TWO COMMON METHODS.

B. INSTRUCTIONAL AREAS

1. SETTING UP INVENTORIES
    - A. IDENTIFYING TYPES OF INVENTORY ITEMS
    - B. DETERMINING THE VALUE OF BEGINNING INVENTORY ITEMS
    - C. RECORDING BEGINNING INVENTORY ITEMS AND VALUES
2. SETTING UP DEPRECIATION SCHEDULES
    - A. DETERMINING TYPES OF ITEMS TO RECORD IN DEPRECIATION SCHEDULES
    - B. DETERMINING THE VALUE OF THE ITEMS
    - C. RECORDING ITEMS AND THEIR VALUES

3. TAKING INVENTORY AT THE END OF THE YEAR

   A. DETERMINING THE VALUE OF ENDING INVENTORY ITEMS

   B. RECORDING ENDING INVENTORY ITEMS AND THEIR VALUES

   C. DETERMINING BEGINNING INVENTORY VALUES FOR THE FOLLOWING YEAR

4. COMPLETING DEPRECIATION SCHEDULES FOR THE YEAR

   A. ENTERING DEPRECIABLE ITEMS PURCHASED DURING THE YEAR

   B. DECIDING ON THE METHOD OF DEPRECIATION FOR EACH ITEM OR GROUP OF ITEMS IN THE DEPRECIATION SCHEDULE

      (1) STRAIGHT LINE
      (2) DECLINING BALANCE
      (3) SUM OF THE YEARS-DIGITS

   C. DECIDING WHETHER TO TAKE THE ADDITIONAL 20% FIRST-YEAR DEPRECIATION ON APPROPRIATE ITEMS

   D. MAKING THE NECESSARY CALCULATIONS RELATING TO DEPRECIATION

   E. CALCULATING THE REMAINING VALUES AT THE END OF THE YEAR

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE EACH STUDENT SET UP INVENTORIES FOR FEED, GRAIN AND LIVESTOCK THROUGH THE USE OF A PREPARED PROBLEM.

   B. HAVE EACH STUDENT PREPARE AN INVENTORY OF ITEMS ON HIS HOME FARM OR OTHER FARM WITH WHICH HE IS FAMILIAR.

   C. HAVE EACH STUDENT PREPARE A LIST OF HIS ASSETS, ALONG WITH THEIR VALUES, WHICH WILL BE A PART OF HIS NET WORTH STATEMENT.

2. HAVE EACH STUDENT SET UP A DEPRECIATION SCHEDULE FOR MACHINERY AND EQUIPMENT FROM A PREPARED PROBLEM.

3. A. HAVE EACH STUDENT CALCULATE THE DEPRECIATION FOR THE YEAR IN THE DEPRECIATION SCHEDULE IN ACTIVITY 2.

   B. HAVE EACH STUDENT CALCULATE THE REMAINING END-OF-YEAR VALUES FOR THE ITEMS IN ACTIVITY 2.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EACH STUDENT SHOULD CORRECTLY ENTER ITEMS IN AN INVENTORY SCHEDULE FOR A GIVEN FARMING OPERATION. CHECK FOR ACCURACY IN TOTALS AND PLACEMENT ON THE SCHEDULE OF THE VARIOUS ITEMS.

2. STUDENTS SHOULD BE ABLE TO CORRECTLY INDICATE ORALLY OR IN WRITING THE DEPRECIABLE ITEMS WHEN GIVEN AN INVENTORY.

3. GIVE STUDENTS A LIST OF DEPRECIABLE ITEMS AND HAVE THEM FIGURE THE YEARLY DEPRECIATION USING AT LEAST ONE OF THE THREE METHODS DISCUSSED WITH 95% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. RECORD BOOKS FOR STUDENTS TO USE IN FILLING OUT INVENTORIES AND DEPRECIATION SCHEDULES

2. FARM RECORD PROBLEMS FOR STUDENT USE

3. FILM ABOUT FARM RECORDS, SUCH AS STARTING TO KEEP RECORDS, SLIDEFILM 350A, VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS, 1972.

F. EXAMPLES OF SUPPORTING REFERENCES

1. FARM ACCOUNTING PROBLEM. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY.

   INCLUDES ALL NECESSARY INFORMATION FOR FIGURING INVENTORIES AND DEPRECIATION FOR A SPECIFIC FARM OPERATION.

2. FARMER'S TAX GUIDE. WASHINGTON, D.C.: U.S. TREASURY DEPARTMENT, INTERNAL REVENUE SERVICE.

   ANNUAL PUBLICATION WHICH ACCOMPANIES TAX FORMS AND IS QUITE USEFUL FOR THIS UNIT.

3. RECORD KEEPING ON THE FARM. VAS 2008A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1963, 8 PAGES.

   PAMPHLET WHICH INCLUDES MATERIAL ON STARTING A SYSTEM OF RECORDS, ORGANIZING, MAKING ENTRIES, AND SUMMARIZING A RECORD BOOK.

KEEPING FARM ACCOUNTS

UNIT CONCEPT: ENTERING RECORDS OF TRANSACTIONS AND PRODUCTION THROUGHOUT THE YEAR IS VERY IMPORTANT TO THE FARM OPERATOR. THIS TASK MUST BE HANDLED IN AN ACCURATE MANNER AND DONE IN SUCH A WAY SO THAT THE RECORDS WILL BE PRESERVED FOR FUTURE USE IN SUMMARIZATION, ANALYSIS AND IN TAX REPORTING.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A LIST OF RECEIPTS FROM A FARM BUSINESS, CORRECTLY ENTER THE RECEIPTS IN THE APPROPRIATE SECTION OF A FARM ACCOUNT BOOK.
2. WHEN GIVEN A LIST OF EXPENDITURES, CORRECTLY ENTER EXPENDITURES IN THE APPROPRIATE SECTION OF A FARM ACCOUNT BOOK.
3. WHEN GIVEN VARIOUS PRODUCTION RECORDS FOR A FARM BUSINESS, CORRECTLY ENTER THE RECORDS IN THE PROPER SECTION OF A FARM ACCOUNT BOOK.

B. INSTRUCTIONAL AREAS

1. STRIVING FOR ACCURACY AND PROPER DIVISION OF RECEIPTS AND EXPENSES
   A. ENTERING RECEIPT AND EXPENSE ITEMS IN "TOTAL" COLUMNS, AS WELL AS "ALLOCATION" COLUMNS
   B. USING COLUMN HEADINGS THAT SIMPLIFY THE FILING OF FEDERAL INCOME TAX
   C. PROVIDING ADDITIONAL COLUMN HEADINGS THAT PERMIT BUSINESS ANALYSIS
2. ENTERING RECEIPT ITEMS AS THEY OCCUR THROUGHOUT THE YEAR
   A. RECORDING SALES OF CROPS
   B. RECORDING SALES OF LIVESTOCK AND LIVESTOCK PRODUCTS
   C. RECORDING MISCELLANEOUS INCOME, SUCH AS FROM CUSTOM WORK

3. ENTERING EXPENDITURES AS THEY OCCUR THROUGHOUT THE YEAR
    - A. ENTERING PURCHASES OF FEED AND GRAIN TO PERMIT ENTERPRISE ANALYSIS
    - B. RECORDING PURCHASES OF FEEDER LIVESTOCK
    - C. RECORDING PURCHASES OF BREEDING LIVESTOCK
    - D. ENTERING OTHER EXPENSES CONCERNED WITH CROPS
    - E. ENTERING OTHER EXPENSES CONCERNED WITH LIVESTOCK
    - F. ENTERING THE PURCHASE OF CAPITAL ITEMS
4. KEEPING RECORDS OF PRODUCTION
    - A. RECORDING ACREAGES AND PRODUCTION OF CROPS
    - B. RECORDING NUMBERS OF LIVESTOCK RAISED, DEATH LOSS, AND WEIGHTS PRODUCED
    - C. RECORDING PRODUCTION OF LIVESTOCK PRODUCTS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE EACH STUDENT MAKE DAY-TO-DAY ENTRIES FROM A FARM RECORD PROBLEM.

   B. HAVE A FARM MANAGEMENT FIELDMAN DISCUSS THE KEEPING OF RECORDS ON FARMS WITH WHICH HE IS FAMILIAR.
2. HAVE STUDENTS KEEP DAY-TO-DAY RECORDS ON THEIR HOME FARMS OR OTHER FARMS WITH WHICH THEY ARE FAMILIAR.
3. HAVE EACH STUDENT BRING IN FROM HOME A SAMPLE OF RECEIPT AND EXPENSE ITEMS FROM A PAST YEAR. ASSIGN DIFFERENT MONTHS TO DIFFERENT STUDENTS AND HAVE THEM READ SOME OF THE ENTRIES TO THE CLASS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE STUDENTS ENTER VARIOUS TYPES OF RECEIPT ITEMS IN A FARM RECORD BOOK WITH COMPLETE ACCURACY.
2. HAVE STUDENTS ENTER VARIOUS TYPES OF EXPENSE ITEMS IN A FARM RECORD BOOK WITH COMPLETE ACCURACY.
3. EACH STUDENT SHOULD BE ABLE TO TRANSFER PRODUCTION RECORDS FROM A LIST TO A FARM ACCOUNT BOOK WITH COMPLETE ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. RECORD BOOKS FOR STUDENTS TO USE IN FILLING OUT FINANCIAL TRANSACTIONS AND PRODUCTION ITEMS.

2. FARM RECORD PROBLEMS FOR STUDENT USE

3. FILM ABOUT FARM RECORDS, SUCH AS KEEPING RECORDS UP TO DATE, SLIDE FILM 351A, VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS, 1972.

F. EXAMPLES OF SUPPORTING REFERENCES

1. FARM RECORDS - A MANAGEMENT TOOL. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 86 PAGES.

   MATERIAL INCLUDES A FIVE YEAR INVENTORY BOOK AND PROCEDURES FOR USING A CASH ACCOUNT BOOK. PRINCIPLES COVERED APPLY TO MOST RECORD KEEPING SYSTEMS.

2. RECORD KEEPING ON THE FARM. URBANA, ILLINOIS: VAS 2008A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1963.

   A PAMPHLET WHICH COVERS IN PART THE PROCEDURES AND TECHNIQUES FOR KEEPING RECORDS.

3. USING THE ILLINOIS FARM RECORD BOOK. VAS 2009A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1969.

   ALTHOUGH DESIGNED FOR USE WITH A SPECIFIC RECORD BOOK, MANY ITEMS DISCUSSED WILL APPLY TO OTHER AVAILABLE RECORD KEEPING SYSTEMS.

PREPARING FARM BUDGETS

UNIT CONCEPT: A COMPLETE BUDGET SHOWS A FARM OPERATOR THE ITEMS NEEDED IN PRODUCTION, THE TOTAL EXPECTED INCOME AND EXPENSES, AND THE NET FARM INCOME. BY PREPARING MORE THAN ONE COMPLETE BUDGET, HE CAN COMPARE PLANS TO DETERMINE WHICH ONE WILL LIKELY RETURN THE MOST INCOME. AN ANNUAL OPERATING BUDGET PROVIDES AN ESTIMATE OF INCOME AND EXPENSES FOR THE YEAR AHEAD.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN LISTS OF INCOME AND EXPENSE ITEMS, CORRECTLY SET UP BUDGETS FOR CROP AND LIVESTOCK ENTERPRISES ACCORDING TO RECOMMENDED PROCEDURES.
2. WHEN GIVEN DATA CONCERNING A FARMING OPERATION, SET UP A COMPLETE BUDGET FOR A FARMING OPERATION, INCLUDING BOTH CROP AND LIVESTOCK PRODUCTION.
3. WORK OUT AT LEAST ONE ADDITIONAL BUDGET AND DETERMINE WHICH ONE WOULD REPRESENT THE MORE PROFITABLE PLAN TO THE SATISFACTION OF THE INSTRUCTOR.
4. WHEN GIVEN A SPECIFIC TYPE AND SIZE OF FARMING OPERATION, ACCURATELY WORK OUT AN OPERATING BUDGET FOR A SPECIFIC YEAR SHOWING CASH INCOME AND CASH EXPENSES FOR THE FARM BUSINESS.

B. INSTRUCTIONAL AREAS

1. PREPARING A BUDGET FOR A CROP ENTERPRISE
    - A. DECIDING WHETHER THE BUDGET IS FOR THE LONG-RUN, SHORT-RUN, OR INTERMEDIATE TIME PERIOD
    - B. ESTIMATING VARIABLE COSTS
    - C. ESTIMATING COSTS THAT ARE USUALLY FIXED IN THE SHORT RUN
    - D. ESTIMATING PRODUCTION AND PRICES BY THE USE OF REALISTIC AVERAGES; MULTIPLYING THESE ITEMS TO FIND THE ESTIMATED VALUE OF PRODUCTION

E. ESTIMATING NET RETURNS BY SUBTRACTING THE APPROPRIATE COSTS FROM THE ESTIMATED VALUE OF PRODUCTION

 (1) FOR THE LONG-RUN SITUATION, SUBTRACT ALL COSTS EXCEPT MANAGEMENT TO FIND RETURNS TO MANAGEMENT AND PROFIT
 (2) FOR THE SHORT RUN, SUBTRACT VARIABLE COSTS TO DETERMINE INCOME ABOVE VARIABLE COSTS
 (3) FOR THE INTERMEDIATE PERIOD, SUBTRACT VARIABLE COSTS AND MACHINERY DEPRECIATION TO FIND INCOME ABOVE DIRECT CROP COSTS

2. PREPARING A BUDGET FOR A LIVESTOCK ENTERPRISE

A. ESTIMATING VARIABLE COSTS FOR LIVESTOCK ENTERPRISES

B. ESTIMATING COSTS THAT ARE USUALLY FIXED

C. ESTIMATING PRODUCTION AND PRICES BY THE USE OF REALISTIC AVERAGES; MULTIPLY THESE ITEMS TO FIND THE ESTIMATED VALUE OF PRODUCTION

D. ESTIMATING NET RETURNS BY SUBTRACTING THE APPROPRIATE COSTS FROM THE ESTIMATED VALUE OF PRODUCTION

 (1) FOR THE LONG-RUN SITUATION, SUBTRACT ALL COSTS EXCEPT MANAGEMENT TO FIND RETURNS TO MANAGEMENT AND PROFIT
 (2) FOR THE SHORT-RUN, SUBTRACT VARIABLE COSTS TO DETERMINE INCOME ABOVE VARIABLE COSTS

3. PREPARING A COMPLETE BUDGET FOR THE FARM BUSINESS

A. ESTIMATING INCOME ABOVE DIRECT COSTS FOR ALL CROPS PLANNED

B. ESTIMATING INCOME ABOVE VARIABLE COSTS FOR ALL LIVESTOCK

C. ADDING CROP AND LIVESTOCK INCOME, PLUS ANY MISCELLANEOUS INCOME, SUCH AS FROM CUSTOM WORK PERFORMED

D. ESTIMATING HIRED LABOR COSTS FOR THE ENTIRE OPERATION

E. ESTIMATING DEPRECIATION AND REPAIRS ON BUILDINGS

F. DETERMINING THE INTEREST CHARGE TO REPRESENT THE RETURN EXPECTED BY INVESTING CAPITAL IN ANOTHER USE

G. ESTIMATING PROPERTY TAXES, CASH RENT, FARM SHARE OF AUTO, UTILITIES, AND INSURANCE, ORGANIZATION DUES, AND OTHER MISCELLANEOUS EXPENSE

H. ADDING ESTIMATED LABOR, DEPRECIATION AND REPAIR, INTEREST CHARGES AND MISCELLANEOUS EXPENSES TO DETERMINE TOTAL COST OF ITEMS NOT DIRECTLY RELATED TO SPECIFIC CROPS OR LIVESTOCK

I. SUBTRACTING INDIRECT COSTS FROM INCOME ABOVE DIRECT COSTS TO FIND LABOR AND MANAGEMENT INCOME

4. PREPARING AN OPERATING BUDGET FOR A SPECIFIC YEAR

A. WORKING OUT A BUDGET SHEET FOR CROPS FOR THE SPECIFIC YEAR

(1) LISTING ACRES, YIELD, TOTAL PRODUCTION, SEED, FERTILIZER, AND CHEMICALS
(2) SUMMARIZING THE CASH NEEDED FOR CROP EXPENSES FOR THE YEAR

B. WORKING OUT A BUDGET SHEET FOR LIVESTOCK FOR THE YEAR

(1) LISTING THE EXPECTED BEGINNING AND ENDING INVENTORY NUMBERS AND VALUE OF LIVESTOCK, AS WELL AS THE NUMBERS TO BE RAISED AND THE EXPECTED DEATH LOSS
(2) LISTING THE EXPECTED NUMBERS AND DOLLAR VALUE OF ANIMALS EXPECTED IN CAPITAL PURCHASES, OPERATING PURCHASES, CAPITAL SALES, AND OPERATING SALES
(3) SUMMARIZING THE ITEMS

C. WORKING OUT A BUDGET SHEET FOR CROP USE AND FEED NEEDS

(1) LIST QUANTITIES AND VALUES OF CROPS EXPECTED IN THE BEGINNING AND ENDING INVENTORIES
(2) ESTIMATING THE AMOUNT OF FEED NEEDED BY LIVESTOCK DURING THE YEAR
(3) ESTIMATING THE FEED THAT WILL NEED TO BE PURCHASED AND THE CROPS THAT WILL BE AVAILABLE FOR SALE

D. FILLING IN A BUDGET SHEET TO SHOW FUNDS NEEDED FOR NEW MACHINERY, EQUIPMENT, IMPROVEMENTS, OTHER CAPITAL, MACHINE HIRE, AND REPAIRS

E. FORMULATING AN ESTIMATE AS TO HOW THE CASH VALUE OF CROP AND LIVESTOCK PRODUCTION WILL COMPARE WITH THE CORRESPONDING CASH EXPENDITURES FOR THE SPECIFIC YEAR BEING PLANNED

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. THROUGH THE USE OF REFERENCES AND DISCUSSION WITH OTHER STUDENTS AND THE INSTRUCTOR, HAVE EACH STUDENT PREPARE A CROP ENTERPRISE BUDGET FOR THE CROP IN WHICH HE IS MOST INTERESTED.

   B. HAVE STUDENTS DIVIDE INTO GROUPS OF THREE OR FOUR ACCORDING TO LIVESTOCK ENTERPRISE SYSTEMS IN THE COMMUNITY. EACH GROUP MUST PREPARE A BUDGET FOR A SPECIFIC SYSTEM, SUCH AS A STEER CALF FEEDING SYSTEM, A YEARLING STEER FEEDING SYSTEM, OR A HEIFER CALF FEEDING SYSTEM.

2. HAVE INDIVIDUAL STUDENTS OR PAIRS CONFER WITH PARENTS OR OTHER FARMERS TO OBTAIN THE DATA NEEDED FOR A COMPLETE BUDGET OF A FARMING OPERATION AND THEN COMPLETE A BUDGET OF THE TOTAL OPERATION.

3. WITH THE DATA OBTAINED IN ACTIVITY 3, HAVE EACH STUDENT OR PAIR COMPLETE AN ADDITIONAL BUDGET TO USE FOR COMPARISON.

4. HAVE STUDENTS PREPARE ANNUAL FARM OPERATING BUDGETS FOR THEIR OWN FARMING OPERATIONS OR OTHERS WITH WHICH THEY ARE FAMILIAR.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. EACH STUDENT SHOULD FIGURE A UNIT BUDGET FOR A SPECIFIC LIVESTOCK OR CROP ENTERPRISE BASED UPON CURRENT PRICES AND VALUES. EVALUATION SHOULD BE BASED UPON THE COMPREHENSIVENESS AND ACCURACY OF THE BUDGET.

2. HAVE EACH STUDENT DEVELOP A COMPLETE BUDGET FOR A GIVEN FARMING OPERATION. THIS BUDGET SHOULD INCLUDE THE FOLLOWING FOR COMPLETE ACCURACY: (1) INCOME ABOVE DIRECT COSTS FOR CROPS, (2) INCOME ABOVE VARIABLE COSTS FOR LIVESTOCK, (3) HIRED LABOR COSTS, (4) DEPRECIATION, (5) INTEREST CHARGES, AND (6) MISCELLANEOUS COSTS SUCH AS RENT AND UTILITIES.

3. USE TWO BUDGETS AND HAVE STUDENTS FIGURE WHICH BUDGET WOULD BE THE MORE PROFITABLE ONE TO USE. BECAUSE OF THE MANY VARIABLES INVOLVED, THIS EXERCISE SHOULD BE ACCOMPLISHED TO THE SATISFACTION OF THE INSTRUCTOR.

4. HAVE EACH STUDENT LIST AND EXPLAIN THE VARIOUS ITEMS THAT SHOULD BE CONSIDERED WHEN PREPARING AN OPERATING BUDGET FOR A FARMING OPERATION. THIS SHOULD BE ACCOMPLISHED WITH 95% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. REFERENCE MATERIAL ON THE SUBJECT OF FARM PLANNING AND BUDGETING
2. COMMONLY USED FORMS AND BUDGET SHEETS
3. REFERENCE MATERIALS ON CROP AND LIVESTOCK PRODUCTION IN THE GENERAL AREA
4. EXCESS TO FARMS FOR VISITATION IN THE COMMUNITY

F. EXAMPLES OF SUPPORTING REFERENCES

1. HAMILTON, JAMES E. AND BRYANT, W.R. PROFITABLE FARM MANAGEMENT, ENGLEWOOD CLIFFS, NEW JERSEY: 1963, 394 PAGES.

   A TEXTBOOK WRITTEN ON THE HIGH SCHOOL LEVEL WHICH COVERS MANY FARM MANAGEMENT PRINCIPLES AND THEIR APPLICATION FOR BETTER PROFIT.

2. HERBST, J.H. FARM MANAGEMENT - PRINCIPLES, BUDGET, PLANS. CHAMPAIGN, ILLINOIS: STIPES PUBLISHING COMPANY. 1970, 292 PAGES.

   A COLLEGE TEXT THAT WOULD BE A VALUABLE REFERENCE FOR FARM PLANNING, RECORD KEEPING, AND CONSIDERATION OF ECONOMIC PRINCIPLES.

3. HINTON, R.A. FARM MANAGEMENT MANUAL. AE-4342. URBANA, ILLINOIS: COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ILLINOIS. 1973, 24 PAGES.

   INCLUDES DATA AND INFORMATION HELPFUL FOR BUDGETING EXERCISES FOR BOTH CROPS AND LIVESTOCK.

4. HINTON, R.A. INCOME POSSIBILITIES FORM. URBANA, ILLINOIS: COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ILLINOIS.

   A FOLDOUT FORM THAT WOULD BE USEFUL FOR PREPARING A COMPLETE FARM BUDGET.

5. UNIT BUDGETS FOR MAJOR LIVESTOCK AND CROP ENTERPRISES. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 59 PAGES.

   INCLUDES UNIT BUDGETS FOR CROP AND LIVESTOCK ENTERPRISES THAT WOULD BE OF VALUE AS GUIDELINES FOR TEACHERS TO USE IN HELPING STUDENTS DEVELOP BUDGETS.

SUMMARIZING FARM RECORDS

UNIT CONCEPT: FARM RECORDS MUST BE SUMMARIZED AT LEAST ONCE A YEAR SO AS TO PROVIDE FOR FARM BUSINESS ANALYSIS AND MEET LEGAL REQUIREMENTS, SUCH AS REPORTING INCOME TAX.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN RECORDS OF A SPECIFIC FARMING OPERATION, CHECK LIVESTOCK NUMBERS AND DETERMINE FEED AND GRAIN QUANTITIES PRIOR TO COMPLETING A FARM BUSINESS SUMMARY.
2. ACCURATELY TOTAL COLUMNS IN A FARM RECORD BOOK AND MAKE APPROPRIATE ACCURACY CHECKS.
3. WHEN GIVEN THE RECORDS OF A FARMING OPERATION, COMPLETE A FARM BUSINESS SUMMARY OR PROFIT AND LOSS STATEMENT.
4. DESCRIBE THE MAJOR DIFFERENCES BETWEEN THE FARM BUSINESS SUMMARY AND THE INCOME TAX SUMMARY ON SCHEDULE F OF FEDERAL INCOME TAX REPORTS.
5. WHEN GIVEN INFORMATION ABOUT LIVESTOCK AND CROP COSTS AND RETURNS, SUMMARIZE INFORMATION RELATING TO CROP AND LIVESTOCK PRODUCTION TO THE SATISFACTION OF THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. CHECKING FEED AND GRAIN QUANTITIES
    - A. DETERMINING THE QUANTITIES OF FEED AND GRAIN THAT NEED TO BE ACCOUNTED FOR
    - B. ACCOUNTING FOR THE QUANTITIES OF FEED AND GRAIN PRODUCED, AS WELL AS THOSE IN BEGINNING INVENTORY AND PURCHASES.
2. CHECKING LIVESTOCK NUMBERS
    - A. DETERMINING THE LIVESTOCK NUMBERS THAT NEED TO BE ACCOUNTED FOR

   B. ACCOUNTING FOR THE LIVESTOCK NUMBERS THAT WERE INCLUDED IN THE RECORDS

3. TOTALING COLUMNS AND MAKING ACCURACY CHECKS
   - A. COMPLETING THE MISSING ENTRIES
   - B. TOTALING COLUMNS THROUGHOUT THE RECORD BOOK
   - C. CHECKING COLUMN TOTALS AGAINST A "GRAND" TOTAL
4. COMPLETING A FARM BUSINESS SUMMARY OR PROFIT AND LOSS STATEMENT
   - A. SUMMARIZING THE CASH RECEIPT ITEMS
   - B. SUMMARIZING THE CASH EXPENSE ITEMS
   - C. ACCOUNTING FOR INVENTORY CHANGES
   - D. ACCOUNTING FOR HOME-RAISED PRODUCTS USED
   - E. SUMMARIZING DEPRECIATION
   - F. FINDING RETURNS TO OPERATOR'S LABOR, CAPITAL, AND MANAGEMENT
   - G. FINDING RETURNS TO SPECIFIC RESOURCES
5. ADJUSTING THE INCOME STATEMENT TO PROVIDE TAX INFORMATION
   - A. DECIDING ON THE METHOD OF ACCOUNTING TO USE IN REPORTING TAX
   - B. CONSIDERING INVENTORIES IF THE ACCRUAL METHOD IS CHOSEN
   - C. SEPARATING ORDINARY INCOME FROM CAPITAL GAINS INCOME
   - D. COMBINING EXPENSES AND ORDINARY INCOME TO DETERMINE NET FARM INCOME AS IT IS SHOWN ON SCHEDULE F BY USE OF EITHER THE CASH OR ACCRUAL METHODS

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. THROUGH THE USE OF A STUDENT'S HOME FARM RECORDS OR HIS OWN FARMING PROGRAM RECORDS, HAVE EACH STUDENT MAKE A FEED AND GRAIN CHECK TO SEE WHETHER QUANTITIES HAVE BEEN ACCOUNTED FOR. DEVELOP FORMULA FOR CALCULATING VOLUME OF VARIOUS SHAPED BINS AND DETERMINE THE QUANTITY OF FEED OR GRAIN IN EACH STORAGE AREA.

B. THROUGH THE USE OF A KEY TO A FARM RECORD PROBLEM, HAVE EACH STUDENT CHECK LIVESTOCK NUMBERS TO SEE THAT QUANTITIES HAVE BEEN PROPERLY ACCOUNTED FOR.

2. GIVE STUDENTS COPIES OF A "RECEIPTS" SECTION OF A RECORD BOOK WITH ERRORS IN THE COLUMN TOTALS. HAVE EACH STUDENT MAKE CORRECTIONS AND CHECK AGAINST THE COLUMN TOTAL (GRAND TOTAL) WHICH INCLUDES ALL OF THE RECEIPT ENTRIES.

3. GIVE STUDENTS SUMMARY FIGURES FROM ALL OF THE PARTS OF A RECORD BOOK. FROM THIS INFORMATION, HAVE EACH STUDENT PREPARE A PROFIT AND LOSS STATEMENT.

4. PROVIDE STUDENTS WITH A FARM BUSINESS SUMMARY AND WITH SUPPLEMENTARY DATA TO INDICATE SUCH ITEMS AS CAPITAL GAINS. FROM THE INFORMATION, HAVE THEM WORK IN PAIRS AND COMPLETE SCHEDULE F OR FEDERAL INCOME TAX FORMS.

5. FROM HIS OWN OR A CLASSMATE'S FARMING PROGRAM RECORDS, HAVE EACH STUDENT PREPARE A SUMMARY FOR A LIVESTOCK ENTERPRISE TO SHOW ALL RETURNS AND COSTS FOR THAT ENTERPRISE FOR THE YEAR.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. THE STUDENT MUST BE ABLE TO CHECK LIVESTOCK NUMBERS AND FEED AND GRAIN QUANTITIES TO FIND WHETHER THESE ITEMS HAVE BEEN PROPERLY ACCOUNTED FOR IN A COMPLETE RECORD.

2. GIVEN THE FILLED-IN COLUMNS OF A RECORD BOOK, THE STUDNET MUST BE ABLE TO ACCURATELY ADD THE ITEMS, EITHER BY HAND OR MACHINE, AND MUST BE ABLE TO MAKE CHECKS FOR ACCURACY.

3. GIVEN THE COLUMN TOTALS FOR VARIOUS PARTS OF THE RECORD BOOK, THE STUDENT SHOULD CORRECTLY COMPLETE A PROFIT AND LOSS STATEMENT FOR THAT BUSINESS.

4. BY THE USE OF COLUMN TOTALS AND A PROFIT AND LOSS STATEMENT, STUDENTS WORKING IN PAIRS SHOULD CORRECTLY COMPLETE SCHEDULE F OF FEDERAL INCOME TAX FORMS.

5. EACH STUDENT SHOULD CORRECTLY PREPARE A SUMMARY SHOWING ALL RETURNS AND COSTS OF A LIVESTOCK AND/OR ENTERPRISE FOR THE YEAR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. KEYS TO RECORD PROBLEMS SHOWING INDIVIDUAL ENTRIES MADE FOR THE YEAR, BUT WITH COLUMN TOTALS OMITTED

2. FORMS FOR FILLING OUT FARM BUSINESS SUMMARIES OF PROFIT AND LOSS STATEMENTS

3. BLANK COPIES OF SCHEDULE F OF FEDERAL INCOME TAX FORMS

F. EXAMPLES OF SUPPORTING REFERENCES

1. FARM RECORDS - A MANAGEMENT TOOL. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1972, 86 PAGES.

   INCLUDES ALL NECESSARY INFORMATION FOR A FARM BUSINESS AND THE NECESSARY FORMS FOR COMPLETING A SET OF RECORDS.

2. FARMER'S TAX GUIDE. WASHINGTON, D.C.: U.S. TREASURY DEPARTMENT, INTERNAL REVENUE SERVICE.

   AN ANNUAL PUBLICATION WHICH IS KEYED TO FEDERAL TAX FORMS FOR FARM BUSINESSES.

3. RECORD KEEPING ON THE FARM. VAS 2008A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1963, 8 PAGES.

   A PAMPHLET WHICH COVERS IN PART THE PROCEDURES AND TECHNIQUE FOR SUMMARIZING FARM RECORDS.

4. USING THE ILLINOIS FARM RECORD BOOK. VAS 2009A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1969, 20 PAGES.

   ALTHOUGH DESIGNED FOR USE WITH A SPECIFIC RECORD BOOK, MANY ITEMS DISCUSSED WILL APPLY TO OTHER AVAILABLE RECORD KEEPING SYSTEMS.

ANALYZING FARM RECORDS

UNIT CONCEPT: TO AID IN BUSINESS IMPROVEMENT, RECORDS MUST BE ANALYZED BY COMPARING RESULTS WITH A STANDARD. THIS COMPARISON MAY BE MADE WITH RESULTS FROM SIMILAR FARMS OR WITH PREVIOUS RESULTS OBTAINED BY THE OPERATOR.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A COMPLETE SET OF FARM RECORDS, CALCULATE MEASURES OF THE FARM BUSINESS FROM SUMMARIZED DATA THAT WILL BE USEFUL IN STUDYING THE FARM BUSINESS.

2. WHEN GIVEN A SET OF RECORDS FOR A FARM BUSINESS, COMPARE MEASURES OF THE FARM BUSINESS WITH STANDARDS RECOGNIZED BY FARM MANAGEMENT SPECIALISTS.

3. FROM THE RECORD-RESULT COMPARISONS, IDENTIFY THE STRONG AND WEAK PARTS OF THE FARM BUSINESS TO THE SATISFACTION OF THE INSTRUCTOR.

B. INSTRUCTIONAL AREAS

1. CALCULATING ANALYSIS MEASURES

   A. DECIDING ON MEASURES IN THE FARM BUSINESS SUMMARY WHICH ARE APPROPRIATE FOR COMPARING WITH STANDARDS

   B. CALCULATING MEASURES OF CROP EFFICIENCY

      (1) YIELD PER ACRE
      (2) VALUE OF CROP PRODUCTION PER ACRE

   C. CALCULATING MEASURES OF LIVESTOCK EFFICIENCY

      (1) RETURNS PER $100 OF FEED FED
      (2) RETURNS ABOVE FEED COST PER BREEDING FEMALE
      (3) FEED COST PER UNIT OF GAIN OR AMOUNT OF PRODUCTION
      (4) POUNDS OF FEED FED PER POUND OF GAIN
      (5) PRODUCTION PER BREEDING FEMALE

D. CALCULATING MEASURES OF BUSINESS VOLUME

(1) VALUE OF PRODUCTION PER MAN
(2) VALUE OF PRODUCTION PER TILLABLE ACRE
(3) AMOUNT OF ANIMALS PRODUCED OR HUNDRED WEIGHT OF MILK PRODUCED

E. CALCULATING MEASURES OF VARIOUS COSTS

(1) LABOR COST PER TILLABLE ACRE
(2) MACHINERY AND EQUIPMENT PER ACRE
(3) BUILDING COST PER ACRE
(4) FERTILIZER COST PER ACRE

F. CALCULATING MEASURES OF EFFICIENCY IN BUYING AND SELLING

(1) PRICE RECEIVED PER HUNDRED-WEIGHT OF LIVESTOCK OR MILK
(2) PRICE PER HUNDRED-WEIGHT PAID FOR FEEDER ANIMALS
(3) COST PER HUNDRED-WEIGHT FOR COMMERCIAL FEED

2. COMPARING ANALYSIS MEASURES WITH STANDARDS FOR SIMILAR FARMS OR WITH THE OPERATOR'S PREVIOUS RESULTS

A. COMPARING MEASURES OF OVERALL FARM EARNINGS

B. COMPARING MEASURES OF CROP EFFICIENCY

C. COMPARING MEASURES OF LIVESTOCK EFFICIENCY

D. COMPARING MEASURES OF BUSINESS VOLUME

E. COMPARING MEASURES OF VARIOUS COSTS

F. COMPARING MEASURES OF EFFICIENCY IN BUYING AND SELLING

G. INTERPRETING RESULTS FROM COMPUTER PRINT-OUT TO COMPARE RECORD RESULTS WITH A STANDARD

3. FINDING STRONG AND WEAK POINTS OF THE FARM BUSINESS

A. LISTING THE MEASURES THAT ARE "AVERAGE" AS COMPARED WITH SIMILAR FARMS

B. LISTING THE STRONG POINTS OF THE BUSINESS AND INDICATING APPROXIMATE PERCENTAGES THAT VARIOUS ITEMS ARE ABOVE THE STANDARD.

C. LISTING THE WEAK POINTS OF THE BUSINESS AND INDICATING THE APPROXIMATE PERCENTAGES THAT VARIOUS ITEMS ARE BELOW THE STANDARD

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. A. HAVE STUDENTS CALCULATE ANALYSIS MEASURES FOR CROPS THROUGH THE USE OF THEIR OWN OR CLASSMATES' RECORDS.

   B. HAVE STUDENTS CALCULATE ANALYSIS MEASURES FOR LIVESTOCK THROUGH THE USE OF THEIR OWN OR CLASSMATES' RECORDS.

2. HAVE STUDENTS COMPARE RESULTS FROM THEIR ANALYSIS MEASURES FOR CROPS AND LIVESTOCK WITH RESULTS FROM OTHER STUDENTS OR FARMERS.

3. HAVE STUDENTS CALCULATE OVERALL FARM EARNINGS MEASURES FOR A FARM SITUATION ILLUSTRATED IN A FARM RECORD PROBLEM AND KEY AND COMPARE THESE MEASURES WITH RESULTS FROM SIMILAR FARMS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. A. GIVEN THE APPROPRIATE RECORD RESULTS, THE STUDENT MUST BE ABLE TO CALCULATE FIVE MEASURES OF EFFICIENCY RELATED TO CROP PRODUCTION.

   B. THE STUDENT SHOULD CORRECTLY CALCULATE TEN MEASURES OF EFFICIENCY RELATED TO LIVESTOCK PRODUCTION.

   C. THE STUDENT SHOULD CORRECTLY CALCULATE FIVE MEASURES RELATED TO OVERALL FARM EARNINGS.

   D. THE STUDENT SHOULD CORRECTLY CALCULATE FIVE MEASURES RELATED TO VOLUME OF BUSINESS.

2. DEVELOP A MATCHING TEST WITH MEASURES OF THE FARM BUSINESS (EARNINGS, CROP AND LIVESTOCK EFFICIENCY, BUSINESS VOLUME) IN ONE COLUMN AND HAVE STUDENTS CORRECTLY MATCH WITH A LIST OF THE MOST APPROPRIATE STANDARDS FOR COMPARISON.

3. GIVE STUDENTS AN ANALYSIS SUMMARY OF A FARM BUSINESS AND HAVE THEM CLASSIFY THE VARIOUS FACETS OF THE BUSINESS AS "STRONG" OR "WEAK" WITH 90% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. THERMOMETER CHARTS FOR PLOTTING RESULTS. (CAN BE MADE UP BY INSTRUCTOR.)

2. SET OF TWELVE TRANSPARENCY MASTERS ON INTERPRETATION OF FARM BUSINESS ANALYSIS BY PAUL FREEMAN. AVAILABLE FROM THE OHIO STATE UNIVERSITY, OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, COLUMBUS, OHIO.

3. FILM ABOUT FARM RECORD ANALYSIS SUCH AS WHAT RECORDS TELL ABOUT THIS FARM, SLIDEFILM 357A, VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS.

4. KEYS TO RECORD PROBLEM WHICH HAVE SUMMARY FIGURES THAT DO NOT HAVE CALCULATIONS COMPLETED FOR ANALYSIS MEASURES.

F. EXAMPLES OF SUPPORTING REFERENCES

1. HERBST, J.H. FARM MANAGEMENT - PRINCIPLES, BUDGETS, PLANS. CHAMPAIGN, ILLINOIS: STIPES PUBLISHING COMPANY. 1970, 292 PAGES.

   A COLLEGE TEXT THAT WOULD BE A VALUABLE REFERENCE FOR FARM PLANNING, RECORD KEEPING AND CONSIDERATION OF ECONOMIC PRINCIPLES.

2. STANDARDS FOR MEASURES OF EFFICIENCY. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS.

   A SIX-PAGE LEAFLET PUBLISHED ANNUALLY WHICH PROVIDES PRODUCTION ESTIMATES THAT CAN BE USED FOR COMPARISON PURPOSES WITH STUDENT'S RECORDS.

3. USING THE ILLINOIS FARM RECORD BOOK. VAS 2009A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1969.

   ALTHOUGH DESIGNED FOR USE WITH A SPECIFIC RECORD BOOK, MANY ITEMS DISCUSSED WILL APPLY TO OTHER AVAILABLE RECORD KEEPING SYSTEMS.

REPLANNING THE FARM BUSINESS FROM RECORD ANALYSIS

UNIT CONCEPT: IF RECORDS HAVE BEEN KEPT ACCURATELY AND SUMMARIZED AND ANALYZED PROPERLY, THE RESULTS CAN BE USEFUL IN REPLANNING THE FARM BUSINESS. THE RESULTS CAN BE USEFUL IN WORKING OUT COMPLETE BUDGETS, PARTIAL BUDGETS, ANNUAL OPERATING BUDGETS, AND CASH FLOW BUDGETS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DESCRIBE A MINIMUM OF THREE PROFIT-MAXIMIZING PRINCIPLES AND EXPLAIN AN APPLICATION OF EACH TO THE SATISFACTION OF THE INSTRUCTOR.

2. GIVEN THE PREVIOUS RECORD RESULTS FROM A FARM BUSINESS, SET UP PARTIAL BUDGETS TO DETERMINE THE PROBABLE OUTCOME OF CHANGES IN THE BUSINESS ACCORDING TO RECOMMENDED PROCEDURES.

3. GIVEN THE PREVIOUS RECORD RESULTS AND INDICATIONS FROM PARTIAL BUDGETS, SET UP AN ANNUAL OPERATING BUDGET SHOWING CASH INCOME AND EXPENDITURES FOR THE FARM BUSINESS FOR THE COMING YEAR TO THE SATISFACTION OF THE INSTRUCTOR.

4. FOR A PARTICULAR FARM BUSINESS, WORK OUT A CASH FLOW BUDGET SHOWING ESTIMATES OF CASH INCOME AND EXPENDITURES FOR THE FARM BUSINESS, FAMILY LIVING EXPENDITURES, AND ALLOWANCES FOR INCOME AND SOCIAL SECURITY TAXES.

B. INSTRUCTIONAL AREAS

1. DEFINING THE USE OF PROFIT-MAXIMIZING PRINCIPLES OR CONCEPTS

   A. THE PRINCIPLE OF DIMINISHING RETURNS

   B. THE FIXED AND VARIABLE COSTS CONCEPT

   C. THE PRINCIPLE OF OPPORTUNITY COSTS

   D. THE RESOURCE SUBSTITUTION

   E. THE PRODUCT SUBSTITUTION

2. SETTING UP A PARTIAL BUDGET
   - A. DEFINING THE MAJOR CHANGE THAT IS BEING CONSIDERED
   - B. DECIDING ON THE LENGTH OF THE PLANNING PERIOD
   - C. ESTIMATING THE ANNUAL ADDITIONAL COSTS OR REDUCED RETURNS FROM MAKING THE CHANGE
   - D. ESTIMATING THE ANNUAL ADDITIONAL RETURNS OR REDUCED COSTS
   - E. DETERMINING THE ESTIMATED CHANGE IN ANNUAL NET INCOME
   - F. CONSIDERING ANY OTHER ITEMS, SUCH AS TIMELINESS OR PERSONAL PREFERENCE, WHICH MAY BE DIFFICULT TO VALUE IN DOLLAR TERMS
   - G. DECIDING WHETHER TO MAKE THE CHANGE BY CONSIDERING "E" AND "F"
3. PREPARING AN OPERATING BUDGET BASED ON PREVIOUS RECORDS
   - A. PREPARING A BUDGET SHEET FOR CROPS
   - B. PREPARING A BUDGET SHEET FOR LIVESTOCK
   - C. WORKING OUT A BUDGET SHEET FOR CROP USE AND FEED NEEDS
   - D. FILLING IN A BUDGET SHEET TO SHOW FUNDS NEEDED FOR NEW MACHINERY, EQUIPMENT, IMPROVEMENTS, OTHER CAPITAL, MACHINE HIRE, AND REPAIRS
   - E. FORMULATING AN ESTIMATE AS TO HOW THE PLANNED CASH INCOME FROM CROPS AND LIVESTOCK PRODUCTION COMPARES WITH THE PLANNED CASH EXPENDITURES
4. PREPARING A CASH FLOW BUDGET
   - A. TRANSFERRING INCOME ITEMS FROM THE OPERATING BUDGET
   - B. ALLOCATING SALES OVER THE APPROPRIATE TIME PERIODS (PROBABLE MONTHLY PERIODS)
   - C. TRANSFERRING EXPENSE ITEMS FROM THE OPERATING BUDGET
     - (1) PURCHASES OF FEEDER LIVESTOCK
     - (2) PURCHASES OF FEED
     - (3) COST OF SEED, FERTILIZER, AND CHEMICALS
     - (4) MACHINE HIRE AND REPAIRS

D. ESTIMATING THE VALUE OF OTHER CASH OPERATING EXPENSES

E. LISTING THE VALUE OF CAPITAL EXPENDITURES

F. LISTING FAMILY LIVING EXPENSES, NONFARM INVESTMENTS, AND ALLOWANCES FOR INCOME AND SOCIAL SECURITY TAXES

G. LISTING THE PRINCIPAL AND INTEREST PAYMENTS ON PREVIOUS COMMITMENTS

H. ALLOCATING ALL EXPENDITURES OVER THE APPROPRIATE TIME PERIODS (PROBABLY MONTHLY PERIODS)

I. COMPLETING THE BUDGET SUMMARY

J. ANALYZING THE BUDGET SUMMARY BY CONSIDERING THESE QUESTIONS:

(1) DOES THE PLAN APPEAR TO BE ONE OF THE MOST PROFITABLE ONES POSSIBLE WITH THE RESOURCES AVAILABLE
(2) WILL FUNDS BE AVAILABLE AS NEEDED THROUGHOUT THE YEAR
(3) COULD DEBT PAYMENTS BE HANDLED IF UNUSUAL SITUATIONS SHOULD OCCUR

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE STUDENTS WORK OUT SOME SAMPLE DATA TO ILLUSTRATE SEVERAL PROFIT-MAXIMIZING PRINCIPLES.

2. HAVE STUDENTS CHOOSE AN AREA OF PARTIAL BUDGETING FROM: 1) CHANGES IN CROPS, 2) CHANGES IN LIVESTOCK, AND 3) CHANGES IN MACHINERY. ASSIGN PARTIAL BUDGET PROBLEMS TO EACH GROUP.

3. HAVE STUDENTS PREPARE AN ANNUAL OPERATING BUDGET FOR NEXT YEAR FOR THEIR OWN OR THEIR PARENTS' FARMING OPERATIONS.

4. STARTING WITH THE ANNUAL OPERATING BUDGETS, HAVE THE STUDENTS PREPARE CASH FLOW BUDGETS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. PROVIDE EACH STUDENT WITH A CASE FARM SITUATION AND USING A PAPER-PENCIL RESPONSE, DESCRIBE HOW THE PROFIT-MAXIMIZING PRINCIPLES WOULD BE USED TO DECIDE ON CHANGES IN THE FARM BUSINESS. THE RESPONSES SHOULD INDICATE THE STUDENT CAN APPLY THE PRINCIPLES TO MAKE CORRECT CHOICES ON WHAT TO PRODUCE, AND ON WHAT KIND AND AMOUNT OF RESOURCES TO USE.

2. USING PARTIAL BUDGET FORMS, HAVE EACH STUDENT SET UP AND WORK OUT A PARTIAL BUDGET WHICH INVOLVES ONE OR TWO MAJOR CHANGES IN ONE ASPECT OF THE BUSINESS (INCREASE SOYBEAN ACREAGE, REDUCE ACREAGE OF WHEAT AND OATS). THE PRODUCTION LEVELS SHOULD BE REALISTIC WITH LOCAL SOIL TYPES, CLIMATE AND THE TYPE AND AMOUNT OF RESOURCES USED. COSTS AND MARKET PRICES SHOULD BE CURRENT AND FIGURED TO THE NEAREST WHOLE DOLLAR.

3. USE AN ANNUAL OPERATING BUDGET FORM WHICH INCLUDES ITEMS FOR CROP INCOME, COSTS AND LIVESTOCK INCOME AND COST. COST AND RETURN ITEMS SHOULD BE BASED UPON REALISTIC PRODUCTION, CURRENT PRICES AND CONSISTANT WITH OUTLOOK DATA.

4. PROVIDE THE STUDENTS WITH THE AMOUNTS AND DATES OF EXPENSE AND RETURN ITEMS AND COMPLETE A CASH FLOW FOR A ONE YEAR PERIOD. EVALUATION SHOULD BE IN TERMS OF THE ACCURACY, APPROPRIATENESS, AND TIME ALLOCATIONS FOR CASH RECEIPTS AND EXPENSES. NEW INVESTMENTS, FAMILY LIVING EXPENSES, INCOME TAX, AND DEBT REPAYMENTS SHOULD BE INCLUDED AS WELL AS FARM OPERATING EXPENSES. FINANCIAL DEMANDS SHOULD BE COMPARED WITH AVAILABLE INCOME AND AN ESTIMATION MADE OF FINANCIAL CONDITION THROUGHOUT THE YEAR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PARTIAL BUDGET FORMS PREPARED BY THE STUDENTS, INSTRUCTOR, OR INSTRUCTIONAL MATERIALS CENTER PERSONNEL.

2. SET OF BUDGET SHEETS FOR ANNUAL OPERATING BUDGETS AVAILABLE FROM INSTRUCTIONAL MATERIALS CENTERS OR THE EXTENSION SERVICE

3. ANNUAL FINANCIAL BUDGET FORMS OR CASH FLOW SHEETS AVAILABLE FROM INSTRUCTIONAL MATERIALS CENTERS OR THE EXTENSION SERVICE.

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL BUSINESS MANAGEMENT - PRINCIPLES THAT AFFECT PRODUCTION. VAS 2040. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1967, 24 PAGES.

   INCLUDES MATERIAL ON THE GENERAL PRINCIPLES OF AGRICULTURAL BUSINESS MANAGEMENT INCLUDING DIMINISHING RETURNS, EQUIMARGINAL RETURNS AND OPPORTUNITY COSTS, FIXED COSTS, AND VARIBLE COSTS.

2. PROFIT-MAXIMIZING PRINCIPLES - INSTRUCTIONAL UNITS FOR VOCATIONAL AGRICULTURE. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1970, 727 PAGES.

   A SERIES OF TEACHING UNITS DESIGNED FOR TEACHER USE WHICH INCLUDES MATERIAL ON DIMINISHING RETURNS, FIXED-VARIABLE COSTS, SUBSTITUTION, OPPORTUNITY COSTS AND COMBINATION OF ENTERPRISES.

FARM TAXATION

UNIT CONCEPT: IN ORDER TO FUNCTION PROPERLY AS A CITIZEN AND MEET OBLIGATIONS AS AN INDIVIDUAL AND A BUSINESSMAN, A FARMER SHOULD HAVE SOME UNDERSTANDING OF FEDERAL, STATE, AND LOCAL TAXES.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. DEFINE THE TYPES OF FUNDS COLLECTED FOR PAYING THE OBLIGATIONS OF THE UNITED STATES GOVERNMENT AND THE USES FOR THESE FUNDS.

2. WHEN GIVEN A REAL OR SIMULATED LIST OF INCOME AND EXPENSE ITEMS FOR A YEAR, COMPLETE A SIMPLE TAX REPORT TO THE FEDERAL GOVERNMENT.

3. DEFINE THE TYPE OF FUNDS COLLECTED FOR PAYING THE OBLIGATIONS OF HIS STATE GOVERNMENT AND THE USES FOR THESE FUNDS.

4. GIVEN A REAL OR SIMULATED LIST OF INCOME AND EXPENSE ITEMS FOR A YEAR, COMPLETE A SIMPLE TAX REPORT TO THE STATE GOVERNMENT ACCORDING TO STANDARD TAX REPORTING PROCEDURES.

5. DEFINE THE TYPE OF FUNDS COLLECTED FOR PAYING THE OBLIGATIONS OF LOCAL GOVERNMENTS AND THE USES FOR THESE FUNDS TO THE SATISFACTION OF THE TEACHER.

B. INSTRUCTIONAL AREAS

1. DETERMINING FEDERAL OBLIGATIONS AND SUBMITTING REPORT FORMS

    A. DEFINING THE USES FOR FEDERAL TAX MONEY ACCORDING TO THE PERCENTAGE OF THE TOTAL REPRESENTED BY EACH MAJOR USE

    B. DEFINING THE DIFFERENCES BETWEEN THE CASH AND ACCRUAL METHODS OF REPORTING FEDERAL INCOME TAX

    C. FILLING OUT SCHEDULE F, FORM 1040

D. FILLING OUT FORM 4797, FORM 1040 FOR A SALE OF COWS OR SOWS

E. FILLING OUT THE FORM 1040 INDIVIDUAL TAX RETURN

F. MAKING AN APPLICATION FOR A SOCIAL SECURITY NUMBER

G. FILLING OUT A REPORT OF SOCIAL SECURITY TAX FOR A SELF-EMPLOYED PERSON

H. MAKING A PLAN FOR PRACTICING INCOME TAX MANAGEMENT FOR A FARM BUSINESS

I. IDENTIFYING METHODS OF PAYMENT FOR ESTATE AND GIFT TAXES

J. APPLYING FOR A REFUND FOR NONHIGHWAY USE OF THE FEDERAL GASOLINE TAX

2. DETERMINING STATE TAX OBLIGATIONS AND SUBMITTING INCOME REPORTING FORMS

A. LISTING THE USES MADE OF STATE TAX MONEY ACCORDING TO THE PERCENTAGE REPRESENTED BY EACH MAJOR USE

B. MAKING A STATE INCOME TAX REPORT IN STATES WHERE THIS IS APPLICABLE

C. REPORTING STATE PROPERTY TAXES IN STATES WHERE THESE ARE APPLICABLE

D. UNDERSTANDING HOW STATE SALES TAX RETURNS ARE FILED BY AGRICULTURAL SUPPLY BUSINESSES

E. MAKING OUT A LICENSE APPLICATION FOR A CAR OR TRUCK TO UNDERSTAND HOW FEES ARE HANDLED BY STATE GOVERNMENTS

F. APPLYING FOR A REFUND FOR NONHIGHWAY USE OF THE STATE GASOLINE TAX

G. DETERMINING HOW STATE INHERITANCE TAX IS PAID

3. DETERMINING LOCAL TAX OBLIGATIONS AND SUBMITTING NECESSARY REPORT FORMS

A. LISTING THE USES MADE OF LOCAL TAX MONEY ACCORDING TO THE PERCENTAGE REPRESENTED BY EACH MAJOR USE

B. DETERMINING HOW PROPERTY ASSESSMENTS ARE MADE

C. DETERMINING HOW TO PAY LOCAL PROPERTY TAXES

D. DETERMINING HOW FEES ARE COLLECTED BY LOCAL GOVERNMENTS

E. DETERMINING HOW MONEY COLLECTED BY THE FEDERAL GOVERNMENT IS TURNED BACK TO LOCAL GOVERNMENTS

F. DETERMINING HOW MONEY COLLECTED BY THE STATE GOVERNMENT IS TURNED BACK TO LOCAL GOVERNMENTS

C, EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE A FARMER TALK TO THE CLASS ABOUT THE KINDS OF TAXES PAID TO ALL KINDS OF GOVERNMENT UNITS.

2. FILL OUT FORMS THAT ARE TYPICAL FOR A FARMER MAKING OUT FEDERAL INCOME AND SOCIAL SECURITY TAXES.

3. FILL OUT FORMS THAT ARE TYPICAL FOR MAKING OUT STATE INCOME TAX REPORTS.

4. HAVE AN ATTORNEY TELL THE CLASS ABOUT ESTATE AND INHERITANCE TAXES PAID BY TYPICAL FAMILIES WHO OWN FARM LAND.

5. VISIT THE LOCAL COURTHOUSE TO FIND OUT ABOUT LOCAL PROPERTY TAXES, AS WELL AS OTHER TAXES AND FEES COLLECTED BY LOCAL GOVERNMENTS.

D, EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT DEFINE THREE TYPES OF TAXES COLLECTED BY THE VARIOUS UNITS OF GOVERNMENT AND THE BROAD CLASSES OF USE FOR THE MONEY SO COLLECTED WITH 90% ACCURACY.

2. A. EACH STUDENT SHOULD BE ABLE TO ACCURATELY MAKE SIMPLE FARM ENTRIES ON FORM 4797 AND SCHEDULE F OF FEDERAL INCOME TAX REPORTS.

   B. EACH STUDENT MUST BE ABLE TO FILL OUT FORM 1040 FOR FEDERAL INCOME TAX ON HIS OWN EARNINGS FOR A PROBLEM INVOLVING AN AGRICULTURAL STUDENT WITH BOTH CROP AND LIVESTOCK ENTERPRISES.

3. HAVE STUDENTS LIST THREE TYPES OF TAX PAYMENTS REQUIRED BY THE STATE GOVERNMENT.

4. EACH STUDENT MUST BE ABLE TO HANDLE ITEMS FROM A FARM BUSINESS REPORTED IN FEDERAL TAX FORMS BEING APPLICABLE TO STATE INCOME TAX. STATE TAX FORMS SHOULD BE COMPLETED WITH 100% ACCURACY.

5. EACH STUDENT MUST BE ABLE TO FIGURE FROM A LOCAL TAX BILL AND ACCOMPANYING TAX RATE SHEET THE AMOUNT OF TAX GOING FOR EACH MAJOR USE WITH COMPLETE ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. FORM 4797, SCHEDULE F, AND FORM 1040, IN SUFFICIENT QUANTITIES FOR STUDENTS TO USE IN MAKING OUT FEDERAL INCOME TAX RETURNS.

2. FORMS NEEDED FOR MAKING OUT STATE INCOME TAX RETURNS

3. STUDENT MATERIALS FOR STUDYING FEDERAL INCOME TAX THAT ARE AVAILABLE FROM THE INTERNAL REVENUE SERVICE

F. EXAMPLES OF SUPPORTING REFERENCES

1. ESTATE PLANNING PACKET. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1972.

   COVERS GENERAL PRINCIPLES OF ESTATE PLANNING AND MAY BE USEFUL FOR PLANNING THE SPECIFIC CONTENT OF THIS UNIT.

2. FARMER'S TAX GUIDE. PUBLICATION 225. WASHINGTON, D.C.: U.S. TREASURY DEPARTMENT, INTERNAL REVENUE SERVICE.

   ANNUAL PUBLICATION ACCOMPANYING TAX FORMS WHICH ARE QUITE USEFUL FOR DEALING WITH SEVERAL OF THE STUDY AREAS INCLUDED IN THIS UNIT.

3. INCOME TAX MANAGEMENT FOR FARMERS. PUBLICATION 2. MADISON, WISCONSIN: EXTENSION SERVICE, AGRICULTURAL BULLETIN BUILDING.

   DEALS WITH MANAGEMENT PRINCIPLES AND CONSIDERATIONS IN TAX REPORTING FOR FARM BUSINESSES.

4. TAX RATES OF LOCAL GOVERNMENT UNITS

   TAX SHEET ACCOMPANYING LOCAL TAX BILLS.

5. UNDERSTANDING TAXES. PUBLICATION 22. WASHINGTON, D.C.: U.S. TREASURY DEPARTMENT, INTERNAL REVENUE SERVICE.

   A STUDENT REFERENCE COVERING THE GENERAL PRINCIPLES AND CONSIDERATION OF INCOME TAX REPORTING. ALSO AVAILABLE IS A TEACHER'S GUIDE.

FARM INSURANCE

UNIT CONCEPT: A FARMER NEEDS TO UNDERSTAND ABOUT INSURANCE SO AS TO PROVIDE FINANCIAL PROTECTION FOR HIS FAMILY AND TO PROTECT HIS BUSINESS FROM VARIOUS RISKS THAT MAY OCCUR.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE [illegible] TO:

1. EXPLAIN HOW INSURANCE WORKS AND WHY IT IS POSSIBLE TO PROTECT ONESELF AGAINST LARGE, UNKNOWN LOSSES SUCH AS THE LOSS OF AN ENTIRE FARM THROUGH LIABILITY TO THE SATISFACTION OF THE INSTRUCTOR.
2. DESCRIBE THE KINDS OF LIFE INSURANCE AND NAME A SITUATION WHERE EACH IS WELL ADAPTED TO THE SATISFACTION OF THE INSTRUCTOR.
3. EXPLAIN WITH 95% ACCURACY WHAT HAZARDS ARE INSURED AGAINST AND THE TYPES OF COVERAGES AVAILABLE THROUGH:
    - A. FIRE INSURANCE
    - B. CROP INSURANCE
    - C. AUTOMOBILE INSURANCE
    - D. HEALTH INSURANCE
    - E. ACCIDENT INSURANCE
    - F. DISABILITY INSURANCE
4. GIVEN A FARM SITUATION WITH CROPS AND LIVESTOCK, PLAN THE KINDS OF INSURANCE AND THE APPROXIMATE AMOUNTS TO HAVE TO PROVIDE ADEQUATE ECONOMICAL PROTECTION.

B. INSTRUCTIONAL AREAS

1. DEFINING THE PRINCIPLES OF INSURANCE
    - A. DESCRIBING THE MAJOR CHARACTERISTICS OF:

    (1) THE PRINCIPLE OF CHANCE OCCURRENCE
    (2) THE PRINCIPLE OF MUTUALITY OF INTERESTS
    (3) THE PRINCIPLE OF SPREADING LOSSES OVER A LARGE AREA
    (4) THE LAW OF AVERAGES
    (5) THE PRINCIPLE OF SELF INSURANCE TO COVER SMALL LOSSES

  B. DEFINING THE DIFFERENCE BETWEEN A MUTUAL AND A STOCK INSURANCE COMPANY

2. PLANNING LIABILITY INSURANCE

  A. PLANNING LIABILITY INSURANCE FOR ITEMS CONNECTED WITH FARM REAL ESTATE OR WITH OPERATION OF THE BUSINESS IN GENERAL

  B. PLANNING FOR LIABILITY COVERAGE FOR AUTOMOBILES, TRUCKS, AND OTHER EQUIPMENT

  C. PLANNING FOR LIABILITY COVERAGE FOR PERSONAL ITEMS NOT CONNECTED WITH VEHICLES, BUSINESS OPERATION, OR REAL ESTATE

3. PLANNING THE APPROPRIATE AMOUNTS AND KINDS OF LIFE INSURANCE

  A. DEFINING THE ADVANTAGES, DISADVANTAGES, AND APPROPRIATE SITUATIONS FOR:

    (1) TERM INSURANCE
    (2) ORDINARY LIFE INSURANCE
    (3) LIMITED-PAY INSURANCE
    (4) ENDOWMENT INSURANCE

  B. DETERMINING PROBABLE INCOME FROM RETIREMENT PROGRAMS, SUCH AS SOCIAL SECURITY

  C. PLANNING A LIFE INSURANCE PROGRAM FOR A GIVEN SITUATION

4. PLANNING THE FIRE AND WINDSTORM INSURANCE FOR THE HOME AND BUSINESS

  A. LISTING THE HAZARDS PROTECTED AGAINST WITH VARIOUS TYPES OF FIRE AND RELATED COVERAGE

  B. PLANNING THE FIRE AND RELATED COVERAGE OF THE FARM HOME AND CONTENTS

  C. PLANNING THE FIRE AND RELATED COVERAGE OF FARM SERVICE BUILDINGS

D. PLANNING THE FIRE AND RELATED COVERAGE OF FARM EQUIPMENT

E. PLANNING COVERAGE FOR FIRE AND RELATED HAZARDS PERTAINING TO LIVESTOCK, STORED GRAIN, AND FEED

5. PLANNING THE COVERAGES AND PREMIUMS RELATING TO CROP INSURANCE

A. DEFINING THE COVERAGES AND PREMIUMS RELATING TO CROP-HAIL INSURANCE

B. DEFINING THE COVERAGES AND PREMIUMS RELATING TO ALL-RISK CROP INSURANCE SPONSORED BY THE FEDERAL GOVERNMENT

C. DEFINING THE COVERAGES AND PREMIUMS RELATING TO ALL-RISK CROP INSURANCE SPONSORED BY PRIVATE COMPANIES

6. PLANNING THE COVERAGE FOR AN AUTOMOBILE

A. DEFINING LIABILITY COVERAGE

B. DEFINING COMPREHENSIVE COVERAGE

C. DEFINING FIRE AND THEFT COVERAGE

D. DEFINING ROAD SERVICE COVERAGE

E. DEFINING OTHER FORMS OF COVERAGE

7. PLANNING THE MOST APPROPRIATE TYPES OF COVERAGE IN THE FORM OF HEALTH, ACCIDENT, AND DISABILITY INSURANCE

A. DEFINING THE FORMS OF HEALTH INSURANCE TO PREVENT THE MOST SERIOUS KINDS OF FINANCIAL LOSSES

B. DEFINING OTHER LOSSES APPROPRIATELY COVERED BY HEALTH INSURANCE FOR THE FARMER

C. PLANNING TO HANDLE LOSSES BY MEANS OF INSURANCE THAT ARE DUE TO ACCIDENTS

D. USING DISABILITY PROTECTION AVAILABLE THROUGH SOCIAL SECURITY COVERAGE

E. PLANNING FOR ANY ADDITIONAL DISABILITY PROTECTION NEEDED

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE CLASS DEVELOP A GAME WHICH CAN BE USED TO DEMONSTRATE THE PRINCIPLES OF INSURANCE. VARIOUS COLORED CHIPS OR MARKED PAPERS CAN BE USED TO REPRESENT A CHANCE OCCURRENCE, AND THESE CAN BE DRAWN FROM A HAT TO ILLUSTRATE THE RISK-TAKING ANY ONE INDIVIDUAL MAY INCUR WITHOUT BEING INSURED. ESPECIALLY DEVELOP THE IDEA OF DETERMINING WHEN SELF INSURANCE IS APPROPRIATE AND WHEN CONDITIONS ARE MORE APPROPRIATE FOR GROUP INSURANCE.

2. HAVE CLASS MEMBERS DIVIDE INTO GROUPS, EACH TO DEVELOP EDUCATIONAL DISPLAYS ON ONE OF THE TYPES OF LIFE INSURANCE. BY USE OF BULLETIN BOARDS, CHARTS OR OTHER VISUAL PRESENTATIONS, ILLUSTRATE AND REPORT ON THE CHARACTERISTICS, ESPECIALLY THE PROTECTION PROVIDED, BY A UNIT COST OF EACH TYPE.

3. STUDENTS MAY ROLE PLAY AN INSURANCE AGENT PRESENTING THE INSURANCE FEATURES OF THE VARIOUS TYPES OF INSURANCE. ONE STUDENT COULD PRESENT FIRE INSURANCE, ANOTHER CROP INSURANCE AND SO ON, SO THAT THE FEATURES OF EACH MAJOR FORM OF INSURANCE ARE COVERED. TIME SHOULD BE GIVEN FOR THE CLASS TO CRITIQUE AND RECORD THE MAJOR FEATURES OF EACH.

4. A CASE FARM SITUATION CAN BE PRESENTED AND THE CLASS ASSEMBLE AN OVER-ALL INSURANCE PROGRAM DETERMINING BOTH THE TYPES OF COVERAGES AND LEVELS OF INSURANCE COVERAGE.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. FROM THE LIST OF FIVE PRINCIPLES OF INSURANCE, THE STUDENTS SHOULD EXPLAIN HOW AN APPLICATION IS MADE WHEN USING SOME FORM OF INSURANCE WITH 90% ACCURACY.

2. FROM A LIST OF THE KINDS OF LIFE INSURANCE, THE STUDENT SHOULD CORRECTLY MATCH EACH KIND TO THE PROPER ITEM FROM A LIST DESCRIBING MAJOR FEATURES OF EACH KIND.

3. A. THE STUDENT SHOULD BE ABLE TO PLAN FOR THE INSURANCE COVERAGE OF AN AUTOMOBILE OWNED BY THE FAMILY, DECIDING WHICH KINDS OF RISKS ARE MOST IMPORTANT FOR COVERAGE AND WHICH MAY BE APPROPRIATELY BORNE BY THE OWNER OR HANDLED AS A DEDUCTIBLE ITEM TO THE SATISFACTION OF THE INSTRUCTOR.

   B. GIVEN A SPECIFIC FARM SITUATION, EACH STUDENT MUST BE ABLE TO LIST SEVERAL MAJOR TYPES OF ITEMS FOR WHICH LIABILITY COVERAGE IS NEEDED TO THE SATISFACTION OF THE INSTRUCTOR.

C. GIVEN A STUDENT'S HOME FARM SITUATION, THE STUDENT SHOULD CORRECTLY LIST TWO ALTERNATIVE WAYS OF HANDLING FIRE INSURANCE AND CROP INSURANCE.

4. GIVEN A SITUATION OF A YOUNG PERSON STARTING TO FARM WITH HIS FATHER OR OTHER RELATIVE, THE STUDENT SHOULD PLAN THE VARIOUS KINDS OF COVERAGES NEEDED AND THE APPROXIMATE AMOUNTS WITH 90% ACCURACY.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. INSURANCE POLICIES MADE AVAILABLE TO THE CLASS FOR STUDY TO VARIOUS INSURANCE COMPANIES
2. FILM ON INSURANCE, SUCH AS INSURANCE IN THE FARM BUSINESS, SLIDE FILM 380A, VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS. 1973.
3. SAMPLE PREMIUM RATES FOR VARIOUS KINDS OF COVERAGE OBTAINED FROM AN INSURANCE AGENT

F. EXAMPLES OF SUPPORTING REFERENCES

1. INSURANCE FOR FARMERS. BULLETIN NO. 2137. WASHINGTON, D.C.: U.S. DEPARTMENT OF AGRICULTURE, U.S. GOVERNMENT PRINTING OFFICE. 1967.

   A PAMPHLET WHICH DEALS WITH GENERAL CONSIDERATIONS OF ACQUIRING INSURANCE FOR FARMING OPERATIONS.

2. LIFE INSURANCE FOR FARM FAMILIES. BULLETIN 1002. ITHACA, NEW YORK: COLLEGE OF AGRICULTURE, CORNELL UNIVERSITY. 1967.

   A COOPERATIVE EXTENSION SERVICE BULLETIN WHICH GIVES CONSIDERATION AND EMPHASES TO TYPES OF LIFE INSURANCE AND THEIR ROLE IN AGRICULTURAL PRODUCTION OPERATIONS.

3. PLANNING FAMILY INSURANCE. EXTENSION FOLDER E-409. EAST LANSING, MICHIGAN: COOPERATIVE EXTENSION SERVICE, MICHIGAN STATE UNIVERSITY. 1968, 6 PAGES.

   A SIX PAGE FOLDOUT DEALING WITH LIFE, HEALTH, HOMEOWNERS, AND AUTOMOBILE INSURANCE PLANNING.

4. UNDERSTANDING YOUR LIFE INSURANCE. NEW YORK, NEW YORK: INSTITUTE OF LIFE INSURANCE. 1972, 64 PAGES.

   THIS REFERENCE GIVES DETAILED CONSIDERATION TO THE SOCIAL ASPECTS OF LIFE INSURANCE, ANNUTIES AND THEIR OPERATION, AS WELL AS PLANNING AND PURCHASING LIFE INSURANCE.

FARM LAW

UNIT CONCEPT: A FARMER NEEDS TO UNDERSTAND FARM LAW SO AS TO ENABLE HIM TO PROVIDE LEGAL PROTECTION FOR HIS BUSINESS AND HIS FAMILY. VARIOUS LEGAL IMPLICATIONS RELATE TO HIS PROPERTY, HIS BUSINESS, AND PARTS OF HIS BUSINESS, SUCH AS HIS LIVESTOCK AND ENVIRONMENTAL QUALITY REGULATIONS.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN A SPECIFIC FARM SITUATION, EXPLAIN THE MAJOR LEGAL PRECAUTIONS TO TAKE WITH REGARD TO PROPERTY WITHIN THE STATE TO THE SATISFACTION OF THE INSTRUCTOR.

2. WHEN GIVEN A FARM SITUATION WITH RENTAL PROPERTY, EXPLAIN THE MAJOR LEGAL PRECAUTIONS FROM THE VIEWPOINT OF A FARM TENANT OR A LANDLORD TO PROVIDE FOR MAXIMUM PROTECTION AND SECURITY.

3. WHEN GIVEN A FARM SITUATION WHERE HIRED LABOR IS INVOLVED, EXPLAIN THE MAJOR LEGAL PRECAUTIONS WITH REGARD TO FARM LABOR TO THE SATISFACTION OF THE INSTRUCTOR.

4. WHEN GIVEN A FARMING SITUATION WHERE NATURAL WATER SOURCES ARE PRESENT, EXPLAIN THE MAJOR LEGAL PRECAUTIONS WITH REGARD TO DRAINAGE AND WATER RIGHTS ACCORDING TO EXISTING STATE LAW.

5. WHEN GIVEN A SPECIFIC LIVESTOCK OPERATION, EXPLAIN THE MAJOR LEGAL PRECAUTIONS WITH REGARD TO LIVESTOCK BASED UPON FEDERAL AND STATE LAWS AND REGULATIONS.

6. WHEN GIVEN A SPECIFIC LIVESTOCK FARMING OPERATION, EXPLAIN THE MAJOR LEGAL PRECAUTIONS WITH REGARD TO ANIMAL DISEASES.

7. WHEN GIVEN A FARM SITUATION, EXPLAIN THE MAJOR LEGAL PRECAUTIONS WITH REGARD TO POLLUTION REGULATIONS AS THEY AFFECT FARMERS ACCORDING TO CURRENT STANDARDS OF THE ENVIRONMENTAL PROTECTION AGENCY.

8. WHEN GIVEN A INDIVIDUAL PROVIDING CUSTOM WORK SERVICES, EXPLAIN THE MAJOR LEGAL PRECAUTIONS WITH REGARD TO CUSTOM WORK PERFORMED FOR OTHER FARMERS.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING THE MAJOR LEGAL PRECAUTIONS RELATING TO PROPERTY

   A. DETERMINING MAJOR PRECAUTIONS REGARDING DEEDS AND ABSTRACTS OF TITLE

      (1) WARRANTY DEEDS
      (2) QUITCLAIM DEEDS
      (3) ABSTRACTS OF TITLE
      (4) TITLE INSURANCE

   B. DETERMINING MAJOR PRECAUTIONS REGARDING ESTATE PLANNING

      (1) WILLS
      (2) ESTATES
      (3) PLANNING OF TITLES
      (4) ESTATE, INHERITANCE, AND GIFT TAXES

   C. DETERMINING OTHER PRECAUTIONS RELATING TO PROPERTY

      (1) PROPERTY TAXES
      (2) FARM BOUNDARIES
      (3) LAND SUPPORT
      (4) TRESPASS, AND FISHING, HUNTING, TRAPPING

2. IDENTIFYING MAJOR LEGAL PRECUATIONS WITH REGARD TO TENANCY

   A. LEGAL PRECAUTIONS RELATING TO FARM LEASES

      (1) REQUIREMENTS OF WRITTEN LEASE
      (2) LEASE TERMINATION UNDER WRITTEN LEASE
      (3) LEASE TERMINATION UNDER VERBAL AGREEMENT

   B. RIGHTS TENANTS HAVE IN REMOVING IMPROVEMENTS

   C. LEGAL CONSEQUENCES OF ABANDONMENT

3. PLANNING PROPER LEGAL CONSIDERATIONS RELATING TO FARM LABOR

   A. PLANNING THE FARM WAGE CONTRACT

   B. DETERMINING EMPLOYER LIABILITY

   C. MAJOR STATE AND FEDERAL LAWS RELATING TO FARM LABOR

   D. MINIMUM WAGE LEVELS UNDER STATE AND FEDERAL LAWS AND WHO IS COVERED

E. THE AFFECT OF FEDERAL AND STATE LAWS ON STUDENT WORKERS IN AGRICULTURE

4. DETERMINING DRAINAGE AND WATER RIGHTS OF FARMERS

A. COMMON LAW PRINCIPLE REGARDING DRAINAGE

B. MAJOR REQUIREMENTS FOR FORMING DRAINAGE DISTRICTS

C. MAJOR PROVISIONS OF LAWS RELATING TO DAMMING OR IMPOUNDING OF WATER

D. MAJOR PROVISIONS OF LAWS RELATING TO USE OF GROUND WATER

E. MAJOR REGULATIONS RELATING TO THE USE OF WATER FOR IRRIGATION IN A SPECIFIC AREA

5. DETERMINING MAJOR LEGAL PRECAUTIONS RELATING TO LIVESTOCK

A. PRINCIPLES RELATING TO ANIMAL MOVEMENT

(1) TRESPASS BY ANIMALS
(2) ESTRAYS
(3) LIVESTOCK ON HIGHWAYS

B. PRECAUTIONS RELATING TO DOGS AND VICIOUS AND WILD ANIMALS

(1) SHEEP-KILLING DOGS
(2) BITING DOGS
(3) VICIOUS AND WILD ANIMALS

6. DETERMINING MAJOR LEGAL PRECAUTIONS WITH REGARD TO ANIMAL DISEASES

A. LEGAL PRECAUTIONS RELATING TO RABIES

(1) GENERAL REQUIREMENTS OF THE LAW
(2) SPECIFIC MEANS OF CARRYING IT OUT

B. LEGAL PRECAUTIONS WITH REGARD TO SWINE DISEASES

(1) HOG CHOLERA
(2) BRUCELLOSIS
(3) OTHER CONTAGIOUS DISEASES

C. LEGAL PRECAUTIONS WITH REGARD TO CATTLE DISEASES

        (1) TUBERCULOSIS
        (2) BRUCELLOSIS
        (3) OTHER CONTAGIOUS DISEASES

7. DETERMINING MAJOR LEGAL PRECAUTIONS RELATING TO POLLUTION REGULATIONS AS THEY AFFECT FARMERS

    A. STATE AND FEDERAL AGENCIES CONCERNED WITH THIS ITEM

    B. MAJOR PROVISIONS THAT AFFECT FARMERS

8. DETERMINING MAJOR LEGAL PRECAUTIONS RELATING TO CUSTOM WORK DONE BY FARMERS

    A. RIGHTS AND LIMITATIONS REGARDING VARIOUS TYPES OF CUSTOM OPERATIONS

    B. REGULATIONS RELATING TO THE USE OF PESTICIDES

    C. LEGAL CONSEQUENCES RELATING TO PROPERTY DAMAGE BY THE CUSTOM OPERATOR

C, EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE CLASS VISIT THE COUNTY COURTHOUSE TO FIND OUT ACTIVITIES CARRIED ON WITH REGARD TO LEGAL ASPECTS OF PROPERTY OWNERSHIP.

2. HAVE A FARM MANAGER SPEAK TO THE CLASS ABOUT HIS EXPERIENCES REGARDING LEGAL ASPECTS OF FARM TENANCY.

3. HAVE A MEMBER OF A STATE OR FEDERAL AGENCY CONCERNED WITH LABOR SPEAK TO THE CLASS ABOUT CERTAIN ASPECTS WITH WHICH THAT AGENCY IS CONCERNED.

4. HAVE AN OFFICER OF A LOCAL DRAINAGE DISTRICT DISCUSS SOME ACTIVITIES OF THE DISTRICT OR ITS FORMATION THAT HAVE LEGAL IMPLICATIONS.

5. HAVE STUDENTS LOOK FOR NEWSPAPER OR FARM MAGAZINE ARTICLES REGARDING ATTACKS BY DOGS ON HUMANS OR DOMESTIC ANIMALS.

6. HAVE A LOCAL VETERINARIAN TELL ABOUT HIS ACTIVITIES THAT RELATE TO THE LEGAL ASPECTS OF ANIMAL DISEASES.

7. HAVE STUDENTS VISIT A LARGE BEEF OR DAIRY FARM TO OBSERVE AND DISCUSS PRECAUTIONS, INCLUDING LEGAL ASPECTS, TO CONTROL POLLUTION.

8. HAVE AN ATTORNEY DISCUSS LIABILITY OF A FARMER, INCLUDING NORMAL OPERATIONS, AS WELL AS PERFORMING OF CUSTOM WORK FOR OTHERS.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. THE STUDENT SHOULD BE ABLE TO EXPLAIN FIVE LEGAL PRECAUTIONS THAT NORMALLY NEED TO BE TAKEN BY A FARMER WITH REGARD TO PROPERTY.

2. THE STUDENT SHOULD BE ABLE TO EXPLAIN THREE LEGAL PRECAUTIONS THAT SHOULD BE OBSERVED BY A FARM TENANT.

3. THE STUDENT SHOULD BE ABLE TO LIST THREE LEGAL PRECAUTIONS THAT A FARMER SHOULD OBSERVE WITH REGARD TO HIRED WORKERS.

4. THE STUDENT SHOULD BE ABLE TO LIST FOUR LEGAL PRECAUTIONS RELATING TO THE USE OF WATER OR TO THE FORMATION OF A DRAINAGE DISTRICT.

5. THE STUDENT SHOULD BE ABLE TO LIST THREE LEGAL PRECAUTIONS RELATING TO FARM ANIMALS, INCLUDING DOGS.

6. THE STUDENT SHOULD BE ABLE TO LIST THREE LEGAL PRECAUTIONS RELATING TO ANIMAL DISEASES.

7. THE STUDENT SHOULD BE ABLE TO EXPLAIN THE MAJOR LEGAL PRECUATIONS THAT A TYPICAL FARMER IN HIS COMMUNITY WOULD NEED TO FOLLOW WITH RELATION TO POLLUTION WITH 95% ACCURACY.

8. THE STUDENT SHOULD BE ABLE TO EXPLAIN THE MAJOR LEGAL PRECAUTIONS A FARMER IN HIS COMMUNITY WOULD NEED TO TAKE IN DOING CUSTOM WORK FOR OTHER FARMERS TO THE SATISFACTION OF THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. PAMPHLETS OR BROCHURES FROM THE FEDERAL GOVERNMENT RELATED TO VARIOUS LEGAL OBLIGATIONS OF FARMERS, SUCH AS THOSE RELATED TO THE FILING OF TAX REPORTS.

2. PAMPHLETS OR BROCHURES FROM STATE GOVERNMENTS ON LEGAL REGULATIONS, SUCH AS INSPECTION ACTIVITIES RELATED TO CROPS, LIVESTOCK, AND POLLUTION CONTROL.

3. PAMPHLETS OR BROCHURES RELATING TO FARMERS THAT MAY BE AVAILABLE FROM COUNTY GOVERNMENTS, AS THOSE RELATING TO ASSESSMENT OF PROPERTY TAXES.

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURE AND THE ENVIRONMENTAL PROTECTION ACT (ILLINOIS). AE-4264. URBANA, ILLINOIS: DEPARTMENT OF AGRICULTURAL ECONOMICS, UNIVERSITY OF ILLINOIS. 1970, PP. 1-24.

   THIS EXTENSION PUBLICATION TELLS WHAT FORMS OF POLLUTION ARE COVERED BY THE ACT IN ILLINOIS. SIMILAR PUBLICATIONS WOULD BE AVAILABLE FROM SOME OTHER STATES.

2. BUESCHER, J. LAW AND THE FARMER. NEW YORK, NEW YORK: SPRINGER PUBLISHING COMPANY. 1960, PP. 1-363.

   THIS BOOK, ACCORDING TO THE PREFACE, INCLUDES MATERIAL THAT APPLIES TO A NUMBER OF STATES.

3. FAMILY PLANNING OF TITLES AND TAXES IN THE TRANSFER OF FARM PROPERTY, CIRCULAR 885. URBANA, ILLINOIS: COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ILLINOIS. 1966, PP. 3-48.

   THIS EXTENSION PUBLICATION COVERS A VARIETY OF MATERIAL ON THE SUBJECT OF ESTATE PLANNING. IT SHOULD FIT IN WITH OTHER MATERIAL ABOUT LAWS RELATING TO PROPERTY.

4. HANNAH AND KRAUSZ. LAW AND COURT DECISIONS ON AGRICULTURE. CHAMPAIGN, ILLINOIS: STIPES PUBLISHING COMPANY. 1968, PP. 1-452.

   THE DECISIONS HAVE PARTICULAR REFERENCE TO ILLINOIS. ACCORDING TO THE PREFACE, THE TEXT OF THE CASES HAS SOMETIMES BEEN SIMPLIFIED SO IT MAY BE MORE MEANINGFUL TO PERSONS WHO HAVE NO LEGAL TRAINING.

5. LAW FOR THE FARMER. VAS 2018B. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1973, PP. 1-24.

   THIS PUBLICATION, AVAILABLE FROM AN INSTRUCTIONAL MATERIALS CENTER, IS CONCERNED MOSTLY WITH ILLINOIS LAWS BUT DISCUSSES SOME LEGAL ASPECTS OF FARMING RELATED TO FEDERAL LAWS AND REGULATIONS. MATERIAL IS CONCERNED WITH PROPERTY, TENANCY, FARM LABOR, DRAINAGE AND WATER RIGHTS, FENCES, LIVESTOCK, AND ANIMAL DISEASES.

6. LEGAL ASPECTS OF CROP SPRAYING, CIRCULAR 990. URBANA, ILLINOIS: COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ILLINOIS. 1969, PP. 1-8.

   THIS EXTENSION PUBLICATION IS AN EASY-TO-READ PRESENTATION OF THE LEGAL ASPECTS OF CROP SPRAYING. IT SHOULD BE USEFUL BOTH FROM THE STANDPOINT OF A FARMER OR OTHER CUSTOM OPERATORS.

7. WATER IN ILLINOIS - USE AND POLLUTION LAWS, CIRCULAR 1024. URBANA, ILLINOIS: COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ILLINOIS. 1972, PP. 1-4.

THIS BROCHURE SHOULD BE USEFUL AS AN EXAMPLE FROM A CORN BELT STATE ILLUSTRATING LAWS RELATED TO WATER USE AND POLLUTION. SOME OTHER STATES SHOULD HAVE SIMILAR MATERIALS.

FINANCING FARM OPERATIONS

UNIT CONCEPT: BECAUSE SUCH A LARGE AMOUNT OF CAPITAL IS NEEDED IN FARMING, IT IS ESPECIALLY IMPORTANT THAT A FARMER UNDERSTAND HOW TO FINANCE HIS PRESENT OPERATIONS, AS WELL AS TO FINANCE AN EXPANSION PROGRAM TO INCREASE HIS INCOME.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. LIST THE MAJOR SOURCES OF FARM-PRODUCTION AND FARM REAL-ESTATE CREDIT AVAILABLE AND GIVE DISTINGUISHING INFORMATION ABOUT EACH TYPE OF AGENCY.

2. WHEN GIVEN THE NECESSARY DATA THAT ACCOMPANY A LOAN, FIGURE THE AMOUNT OF INTEREST, AND IN SOME CASES, THE EFFECTIVE OR TRUE INTEREST RATE.

3. WHEN GIVEN AMORTIZATION TABLES OF INTERMEDIATE-TERM LOANS AND PAYMENT TABLES FOR REAL ESTATE LOANS, CALCULATE: A) THE TOTAL INTEREST PAID OVER THE LIFE OF THE LOAN, AND B) THE TOTAL PAYMENT OF PRINCIPAL AND INTEREST IN ANY YEAR OF THE LOAN.

4. WHEN GIVEN DATA RELATING TO INCOME AND EXPENSES, PREPARE AN ANNUAL OPERATING BUDGET FOR A FARM BUSINESS.

5. WHEN GIVEN AN ANNUAL OPERATING BUDGET, ALONG WITH DATA ON FAMILY LIVING EXPENSES, INCOME AND SOCIAL SECURITY TAXES, CAPITAL PURCHASES PLANNED, DEBT REPAYMENTS THAT WILL BECOME DUE, AND CASH RESERVE DESIRED AT THE END OF A MONTH, PREPARE A CASH FLOW BUDGET.

6. WHEN GIVEN DATA WITH REGARD TO A FARMER'S CHARACTER, NET WORTH, PAST RESULTS, AND NEW PLAN, PRESENT A CASE TO A LENDING AGENCY FOR OBTAINING THE NECESSARY CREDIT.

B. INSTRUCTIONAL AREAS

1. DETERMINING THE MAJOR SOURCES OF FARM CREDIT, ALONG WITH DISTINGUISHING INFORMATION ABOUT AGENCIES

   A. IDENTIFYING MAJOR SOURCES OF FARM-PRODUCTION CREDIT

- (1) COMMERICAL BANKS
- (2) COMMODITY CREDIT CORPORATION
- (3) FARMERS HOME ADMINISTRATION
- (4) INDIVIDUALS
- (5) MERCHANTS AND DEALERS
- (6) PRODUCTION CREDIT ASSOCIATIONS

B. IDENTIFYING SOURCES OF FARM-REAL-ESTATE CREDIT

- (1) COMMERCIAL BANKS
- (2) FARMERS HOME ADMINISTRATION
- (3) FEDERAL LAND BANK ASSOCIATIONS
- (4) INDIVIDUALS
- (5) LIFE INSURANCE COMPANIES

2. CALCULATING THE AMOUNT OF INTEREST AND THE EFFECTIVE RATES

A. CALCULATING INTEREST BY THE "STRAIGHT" INTEREST METHOD

- (1) FOR TERMS OF ONE YEAR
- (2) FOR TERMS LONGER THAN ONE YEAR
- (3) FOR TERMS OF LESS THAN ONE YEAR

B. CALCULATING THE EFFECTIVE RATE OF INTEREST ON DISCOUNTED LOANS

- (1) FOR TERMS OF ONE YEAR
- (2) FOR TERMS LONGER THAN ONE YEAR
- (3) FOR TERMS OF LESS THAN ONE YEAR

C. CALCULATING THE EFFECTIVE RATE OF INTEREST ON INSTALLMENT LOANS

- (1) WHERE ONLY AN INTEREST CHARGE IS INVOLVED
- (2) WHERE RELATED CHARGES ARE INCLUDED

3. CALCULATING PRINCIPAL AND INTEREST PAYMENTS

A. EQUAL-PAYMENT PLAN

- (1) INTERMEDIATE-TERM LOANS
- (2) REAL ESTATE LOANS

B. DECREASING PAYMENT PLAN

- (1) INTERMEDIATE-TERM LOANS
- (2) REAL ESTATE LOANS

4. PREPARING AN ANNUAL OPERATING BUDGET

A. PREPARING A BUDGET SHEET FOR CROPS

(1) ACRES, YIELD, PRODUCTION, SEED, FERTILIZER, AND CHEMICALS
(2) SUMMARY OF CASH NEEDED FOR CROP EXPENSES

B. PREPARING A BUDGET SHEET FOR LIVESTOCK

(1) BEGINNING AND ENDING INVENTORIES, AMOUNT OF PRODUCTION
(2) CAPITAL PURCHASES, OPERATING PURCHASES, CAPITAL SALES, OPERATING SALES
(3) SUMMARY OF TOTALS OF EACH TYPE OF ITEM

C. PREPARING A BUDGET SHEET FOR CROP USE AND FEED NEEDS

(1) QUANTITIES AND VALUES OF CROPS IN INVENTORIES
(2) ESTIMATE OF FEED NEEDED
(3) ESTIMATES OF HOME-GROWN AND PURCHASED FEEDS

D. PREPARING A BUDGET SHEET SHOWING FUNDS NEEDED FOR MACHINERY, EQUIPMENT, IMPROVEMENTS, MACHINE HIRE, AND REPAIRS

E. COMPARING CASH TO BE RECEIVED FROM CROPS AND LIVESTOCK WITH THE CORRESPONDING CASH EXPENDITURES PLANNED

5. PREPARING A CASH FLOW BUDGET

A. TRANSFERRING INCOME ITEMS FROM THE ANNUAL OPERATING BUDGET

(1) SALES OF CROPS NOT NEEDED FOR FEED
(2) OPERATING SALES AND CAPITAL SALES OF LIVESTOCK

B. TRANSFERRING EXPENSE ITEMS FROM OPERATING BUDGET

(1) PURCHASES OF FEEDER LIVESTOCK
(2) PURCHASES OF FEED
(3) EXPENSES FOR SEED, FERTILIZER, AND CHEMICALS
(4) MACHINE HIRE AND REPAIRS

C. ESTIMATING OTHER CASH OPERATING EXPENSES

(1) FUEL AND OIL
(2) HIRED LABOR
(3) CASH RENT
(4) PROPERTY TAXES
(5) BREEDING FEES AND VETERINARY EXPENSES
(6) FARM SHARE OF AUTO, UTILITIES, AND INSURANCE, ORGANIZATION DUES, AND MISCELLANEOUS EXPENSES

- D. LISTING THE VALUE OF CAPITAL EXPENDITURES, SUCH AS BREEDING LIVESTOCK, MACHINERY, EQUIPMENT, AND BUILDINGS
- E. ESTIMATING AND RECORDING FAMILY LIVING EXPENSES, NONFARM INCOME, NONFARM INVESTMENTS, AND INCOME AND SOCIAL SECURITY TAXES
- F. ESTIMATING AND RECORDING PRINCIPAL AND INTEREST PAYMENTS ON PREVIOUS COMMITMENTS
- G. ALLOCATING INCOME AND EXPENDITURES OVER THE APPROPRIATE TIME PERIODS (PROBABLY MONTHLY PERIODS)
- H. COMPLETING THE BUDGET SUMMARY
- I. ANALYZING THE BUDGET SUMMARY
- J. MAKING CASH FLOW PROJECTIONS FOR SEVERAL YEARS

6. PRESENTING THE CASE TO A LENDER

- A. EXPLAINING CHARACTER IMPLICATIONS AND THOSE' RELATING TO MANAGERIAL ABILITY
  - (1) RECORD OF MEETING OBLIGATIONS IN THE PAST
  - (2) MANAGERIAL ACCOMPLISHMENTS
- B. EXPLAINING FINANCIAL POSITION AND PROGRESS
  - (1) NET WORTH STATEMENT
  - (2) CHANGES OCCURRING IN NET WORTH
- C. DESCRIBING REPAYMENT CAPACITY
  - (1) SIZE OF BUSINESS
  - (2) CROP YIELDS AND LIVESTOCK FEED CONVERSION RATIOS
  - (3) BUYING AND SELLING ABILITY
  - (4) PRODUCTION COSTS
  - (5) LIVING EXPENSES
  - (6) DISTRIBUTION OF INCOME THROUGHOUT YEAR
- D. PRESENTING THE LOAN PURPOSE AND INDICATING AVAILABLE COLLATERAL
- E. NEGOTIATING FOR THE KIND AND TERMS OF LOAN BEST SUITED TO THE PARTICULAR SITUATION

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENT MAKE A LIST OF EACH MAJOR KIND OF AGENCY THAT MAKES FARM PRODUCTION LOANS, AND EACH KIND THAT MAKES FARM REAL ESTATE LOANS. HAVE THE STUDENTS LIST A SPECIFIC AGENCY FOR EACH TYPE IN THE LOCAL COMMUNITY OR A NEARBY COMMUNITY.

2. GIVE STUDENTS PROBLEMS TO WORK IN WHICH THEY CALCULATE THE INTEREST ON LOANS OF UP TO THREE YEARS DURATION; ALSO, INCLUDE PROBLEMS SHOWING TOTAL INTEREST CHARGES AND HAVE THE STUDENTS CALCULATE THE EFFECTIVE OR TRUE RATE.

3. PROVIDE THE STUDENTS WITH AMORTIZATION TABLES AND OTHER PAYMENT TABLES FOR INTERMEDIATE- AND LONG-TERM LOANS. HAVE THEM CALCULATE SPECIFIC PAYMENTS OF PRINCIPAL AND INTEREST, AS WELL AS TOTAL INTEREST THROUGHOUT THE LOAN PERIOD.

4. HAVE STUDENTS PREPARE ANNUAL OPERATING BUDGETS FOR THEIR OWN FARMING OPERATIONS OR OTHERS WITH WHICH THEY ARE FAMILIAR.

5. STARTING WITH THE ANNUAL OPERATING BUDGETS, ALONG WITH OTHER INFORMATION PROVIDED, HAVE THE STUDENTS PREPARE CASH FLOW BUDGETS.

6. A. HAVE A LOAN OFFICER FROM A LOCAL CREDIT AGENCY DISCUSS WITH THE CLASS WHAT THAT AGENCY IS LOOKING FOR IN A BORROWER.

   B. HAVE SEVERAL STUDENTS PUT ON A DEMONSTRATION OF HOW THEY WOULD PRESENT A CASE FOR CREDIT TO A LENDER.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT LIST FIVE MAJOR SOURCES OF FARM PRODUCTION CREDIT AND FIVE MAJOR SOURCES OF FARM REAL ESTATE CREDIT WITH 95% ACCURACY.

2. WITH THE HELP OF TABLES, HAVE EACH STUDENT CORRECTLY FIGURE THE AMOUNT OF INTEREST TO BE PAID DURING THE TERM OF A LOAN AND THE APPROXIMATE EFFECIVE OR TRUE INTEREST RATE ON TYPICAL FARM LOANS.

3. WITH THE HELP OF TABLES, THE STUDENT WILL BE ABLE TO CORRECTLY FIGURE WITH 95% ACCURACY, THE PRINCIPAL AND INTEREST PAYMENTS FOR ANY YEAR DURING THE LOAN PERIOD, AS WELL AS THE AMOUNT OF PAYMENT THAT MAKES UP INTEREST AND THE AMOUNT THAT GOES TOWARD THE PAYMENT OF THE PRINCIPAL.

4. WORKING WITH A CLASSMATE, HAVE EACH STUDENT PREPARE AN ANNUAL OPERATING BUDGET FOR HIS OWN FARM SITUATION OR FOR ANOTHER FARM TO THE SATISFACTION OF THE INSTRUCTOR.

5. IN RESPONSE TO SEVERAL SITUATIONS PRESENTED BY THE INSTRUCTOR, HAVE STUDENTS INDICATE THE SITUATIONS WHEN CREDIT IS NEEDED WITH 90% ACCURACY.

6. THE STUDENT, IN A ROLE-PLAYING SITUATION WITH A CLASSMATE, SHOULD BE ABLE TO PRESENT A STRONG CASE REQUESTING A LOAN OR LINE OF CREDIT FOR HIS HOME FARM SITUATION TO THE SATISFACTION OF THE INSTRUCTOR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. ANNUAL FINANCIAL BUDGET (CASH FLOW) FORMS PREPARED BY THE EXTENSION SERVICE IN VARIOUS STATES

2. SET OF BUDGET SHEETS FOR PREPARING AN ANNUAL OPERATING BUDGET, AVAILABLE FROM THE EXTENSION SERVICE IN VARIOUS STATES

3. BLANK NOTE FORMS

F. EXAMPLES OF SUPPORTING REFERENCES

1. AGRICULTURAL CREDIT INSTRUMENTS. VAS 6007. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1973, PP. 1-12.

   THIS PUBLICATION OF AN INSTRUCTIONAL MATERIALS CENTER PROVIDES INFORMATION ON CHECKS, DRAFTS, PROMISSORY NOTES, SECURED TRANSACTIONS, WAREHOUSE RECEIPTS, BILLS OF LADING, RELEASES, AND SATISFACTIONS. A NUMBER OF ILLUSTRATIONS ARE INCLUDED.

2. FACTORS INVOLVED IN THE BORROWING PROCESS. VAS 2028A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1973, PP. 1-8.

   THIS PUBLICATION OF AN INSTRUCTIONAL MATERIALS CENTER LISTS RULES FOR THE SOUND AND WISE USE OF CREDIT, DESCRIBES SOUND LENDING PRACTICE, AND GIVES THE IMPORTANT STEPS IN OBTAINING CREDIT.

3. FARM AND PERSONAL FINANCES. DANVILLE, ILLINOIS: INTERSTATE PRINTERS AND PUBLISHERS, INC. 1968, PP. 3-127.

THIS BOOK, WRITTEN IN AN EASY-TO-UNDERSTAND MANNER, DISCUSSES SUCH ITEMS AS MAKING FINANCIAL PLANS, SOURCES OF CAPITAL, CREDIT INSTRUMENTS, AND FINANCIAL TERMS.

4. MECHANICS OF FARM FINANCIAL PLANNING. CIRCULAR 1042. URBANA, ILLINOIS: COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ILLINOIS. 1971, PP. 1-19.

   THIS EXTENSION PUBLICATION TELLS HOW TO FILL IN VARIOUS FORMS RELATED TO FINANCIAL PLANNING.

5. PLANNING FOR REPAYMENT OF LOANS. VAS 2026A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1969, PP. 1-16.

   THIS PUBLICATION OF AN INSTRUCTIONAL MATERIALS CENTER TELLS HOW TO ESTIMATE INCOME AND EXPENSES FOR FUTURE YEARS, PREPARE CASH FLOW BUDGETS, AND PROJECT NET WORTH CHANGES OVER A PERIOD OF YEARS.

6. SOURCES OF FARM CREDIT. VAS 2027. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1973, PP. 1-12.

   THIS PUBLICATION TELLS ABOUT THE KINDS AND AMOUNTS OF CREDIT USED, SOURCES OF PRODUCTION CREDIT AND FARM MORTGAGE CREDIT, WHAT A LENDER LOOKS FOR IN A BORROWER, AND WHAT A BORROWER SHOULD LOOK FOR IN A LENDER.

7. USING FARM REAL ESTATE LOANS. VAS 2033A. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1974, PP. 1-8.

   THIS PUBLICATION GIVES AN INDICATION OF HOW MUCH MONEY TO BORROW ON LAND, THE TERMS ON WHICH THE LOAN SHOULD BE REPAID, THE PURPOSE OF CONTRACT FINANCING, AND SAMPLE FILLED-IN FORMS RELATING TO THE USE OF FARM REAL ESTATE CREDIT.

SUPERVISING FARM LABOR FOR EFFICIENCY

UNIT CONCEPT: THE TREND TOWARD LARGER FARMS OFTEN RESULTS IN THE USE OF MORE HIRED LABOR. SINCE THE EFFICIENCY AND PRODUCTIVITY OF HIRED LABOR IS CONSIDERABLY AFFECTED BY WORK INCENTIVES, TRAINING AND EMPLOYER-EMPLOYEE RELATIONS, THE PLANNING AND SUPERVISING OF LABOR ARE IMPORTANT TOWARD OBTAINING HIGHER FARM PRODUCTION IN RELATION TO COST.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. WHEN GIVEN DATA RELATING TO FARM COSTS AND RETURNS, EXPLAIN WHY LABOR EFFICIENCY IS IMPORTANT.
2. WHEN GIVEN DATA REGARDING PRODUCTION, AMOUNT OF LABOR USED, AND LABOR COSTS, CALCULATE MEASURES OF LABOR EFFICIENCY WITH 95% ACCURACY.
3. WHEN GIVEN A SPECIFIC FARM SITUATION, EXPLAIN HOW TO GET MORE EFFECTIVE USE OF LABOR THROUGH THE PLANNING OF OPERATIONS TO THE SATISFACTION OF THE INSTRUCTOR.
4. WHEN GIVEN A SITUATION WHERE HIRED LABOR IS INVOLVED, EXPLAIN WHAT PROCEDURES TO USE IN DEALING WITH WORKERS TO GET THEM TO ACCOMPLISH MORE PER WORKER.

B. INSTRUCTIONAL AREAS

1. IDENTIFYING CHANGES TAKING PLACE IN FARM COSTS
    - A. COST CHANGES IN GENERAL
        - (1) COMPARISON OF PER-ACRE COSTS DURING THE LAST TWENTY YEARS
        - (2) RELATIONSHIPS BETWEEN COSTS AND RETURNS DURING THAT TIME
    - B. CHANGES IN LABOR COSTS
        - (1) WAGE RATES
        - (2) FRINGE BENEFITS
        - (3) AMOUNT OF LABOR IN RELATION TO OTHER COSTS

2. CALCULATING MEASURES OF LABOR EFFICIENCY
    A. CALCULATING PRODUCTION VALUE PER WORKER
        (1) HOW TO CALCULATE
        (2) USEFULNESS AND SHORTCOMINGS OF MEASURE
    B. CALCULATING FARM WORK UNITS PER WORKER
        (1) HOW TO CALCULATE
        (2) USEFULNESS AND SHORTCOMINGS OF MEASURE
    C. LABOR COST PER TILLABLE ACRE
        (1) HOW TO CALCULATE
        (2) USEFULNESS AND SHORTCOMINGS OF MEASURE
    D. LABOR EFFICIENCY INDEX
        (1) HOW TO CALCULATE
        (2) USEFULNESS AND SHORTCOMINGS OF MEASURE
3. PLANNING OPERATIONS FOR MORE EFFECTIVE USE OF LABOR
    A. PLANNING WORK SCHEDULES
    B. PLANNING FARM WORK SIMPLIFICATION
4. PROCEDURES TO USE IN DEALING WITH WORKERS TO INCREASE WORK ACCOMPLISHMENT
    A. WAGE CONSIDERATIONS
    B. FRINGE BENEFITS
        (1) PAID VACATIONS
        (2) HEALTH AND ACCIDENT INSURANCE
        (3) RETIREMENT PROGRAM
        (4) PERQUISITES, INCLUDING FOOD OR UTILITIES
        (5) INCENTIVE PAYMENTS BASED ON PRODUCTION
    C. INSTRUCTIONS TO GIVE TO WORKERS
        (1) TRAINING PERIOD
        (2) NECESSARY DETAILS FOR SPECIFIC TASKS
    D. MAKING LABOR MORE PLEASANT FOR WORKERS
        (1) OPERATOR DOES SOME UNPLEASANT WORK HIMSELF
        (2) MACHINERY AND EQUIPMENT USED TO LIGHTEN WORK LOAD WHEN ECONOMICALLY FEASIBLE

E. DETERMINING HOW TO HELP CREATE FEELINGS OF WORKER SATISFACTION

(1) IMPROVEMENT OF WORKER IMAGE THROUGH BETTER EMPLOYER-EMPLOYEE RELATIONS
(2) AREA OF RESPONSIBILITY GIVEN TO WORKER
(3) INSTRUCTIONS DISCUSSED RATHER THAN DICTATED
(4) EMPLOYEE AND HIS FAMILY ENCOURAGED TO PARTICIPATE IN COMMUNITY ACTIVITIES

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE A FARM MANAGEMENT FIELDMAN DISCUSS WITH THE CLASS THE CHANGES THAT HAVE TAKEN PLACE IN FARM COSTS, INCLUDING THE CHANGES IN WAGE RATES AND TOTAL LABOR COSTS.

2. PROVIDE STUDENTS WITH DATA RELATING TO THE VARIOUS MEASURES OF LABOR EFFICIENCY AND HAVE THEM CALCULATE THE RESULTS.

3. GIVE THE CLASS DATA ON TIME REQUIRED TO PERFORM TASKS CONNECTED WITH VARIOUS FARM PRODUCTION ENTERPRISES AND HAVE STUDENTS PLAN WHEN THE JOBS WILL BE DONE, OR USE A "GAME" WHICH INVOLVES THE ACCOMPLISHMENT OF THE NECESSARY TASKS FOR ENTERPRISES IN A LIMITED AMOUNT OF TIME.

4. CLASS MEMBERS, WORKING IN PAIRS, USE ROLE PLAYING SITUATIONS IN WHICH ONE IS THE EMPLOYER AND THE OTHER IS THE EMPLOYEE AND DISCUSS VARIOUS ASPECTS OF THE EMPLOYMENT.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT TELL WHERE LABOR RANKS AS A COST COMPARED WITH OTHER ITEMS ON THREE TYPES OF FARMS IN HIS STATE IN A RECENT YEAR WITH 90% ACCURACY.

2. HAVE EACH STUDENT CALCULATE RESULTS FOR THREE TYPES OF LABOR EFFIEIENCY MEASURES WITH 95% ACCURACY.

3. HAVE EACH STUDENT WORK OUT A PLAN FOR USING LABOR ON HIS HOME FARM OR OTHER FARM WITH WHICH HE IS FAMILIAR TO THE SATISFACTION OF THE INSTRUCTOR.

4. EACH STUDENT SHOULD CORRECTLY LIST AND EXPLAIN FIVE PROCEDURES TO USE IN DEALING WITH WORKERS TO GET THEM TO ACCOMPLISH MORE PER WORKER.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. FARMS IN COMMUNITY WHERE STUDENTS CAN VISIT AND LEARN FIRST-HAND ABOUT FARM WORKERS AND THE RELATIONSHIP BETWEEN EMPLOYERS AND EMPLOYEES.

F. EXAMPLES OF SUPPORTING REFERENCES

1. BALANCING THE LABOR SUPPLY AND THE FARM BUSINESS. VAS 2035. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1963, PP. 1-8.

   THIS MATERIAL FROM AN INSTRUCTIONAL MATERIALS CENTER TELLS ABOUT THE AMOUNT OF LABOR NEEDED FOR VARIOUS JOBS AND HOW TO MEET THE NEEDS AT THE MOST APPROPRIATE TIMES.

2. HERBST, J.H. FARM MANAGEMENT - PRINCIPLES, BUDGETS, PLANS. CHAMPAIGN, ILLINOIS: STIPES PUBLISHING COMPANY. 1970, PP. 138-159.

   THIS TEXTBOOK CONTAINS A CHAPTER ON "PLANNING TO MEET LABOR NEEDS" WHICH DISCUSSES A NUMBER OF ITEMS INCLUDED UNDER "INSTRUCTIONAL AREAS."

3. KEEPING GOOD HIRED FARM LABOR, EC-306. LAFAYETTE, INDIANA: COOPERATIVE EXTENSION SERVICE, PURDUE UNIVERSITY. 1966, PP. 3-17.

   THIS EXTENSION PUBLICATION DISCUSSES IN AN EASY-TO-READ MANNER SEVERAL TOPICS PREVIOUSLY MENTIONED, SUCH AS TENURE AND SALARIES, GOOD LABOR RELATIONS, AND INCENTIVE PLANS.

PLANNING WORK SCHEDULES

UNIT CONCEPT: A FARMER MUST BE ABLE TO PLAN WORK SCHEDULES FOR THE LABOR USED IN HIS OPERATIONS SO HE CAN PROVIDE THE LABOR NEEDED, MAINTAIN A HIGH LEVEL OF PRODUCTION, USE LABOR EFFICIENTLY, AND HAVE A REASONABLE LABOR COST IN RELATION TO PRODUCTION.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. FOR A GIVEN CROP OR LIVESTOCK ENTERPRISE, DEVELOP A WRITTEN LABOR CALENDAR SHOWING THE JOBS WHICH MUST BE DONE AND THE PERIOD OF TIME ON THE CALENDAR WHEN THEY ARE TO BE DONE ACCORDING TO AGRONOMY OR LIVESTOCK SCIENCE STANDARDS FOR THE AREA TO ACHIEVE MOST PROFITABLE PRODUCTION.

2. USING A LABOR CALENDAR INDICATING THE JOBS AND TIME PERIODS FOR CONDUCTING THE JOBS IN A LIVESTOCK OR CROP ENTERPRISE, DETERMINE THE TOTAL HOURS OF LABOR REQUIRED MONTH BY MONTH FOR EACH UNIT OF PRODUCTION ACCORDING TO LABOR STANDARDS FROM STATE OR LOCAL AGRONOMY AND LIVESTOCK SCIENCE RESEARCH DATA.

3. GIVEN A SPECIFIC JOB, ALONG WITH INFORMATION ON TIME AND MOTION STUDIES PREPARE A WRITTEN PLAN TO CARRY OUT A WORK SIMPLIFICATION PROCEDURE TO THE SATISFACTION OF THE INSTRUCTOR.

4. GIVEN THE DATA ON THE JOBS TO BE DONE AND THE TIME TO DO THEM, DEVELOP A PLAN FOR DETAILED LABOR NEEDS FOR A MONTH OR SEASON OF THE YEAR WHICH PROVIDES FOR SUFFICIENT LABOR TO THE SATISFACTION OF THE INSTRUCTOR.

5. GIVEN THE VARIOUS INFORMATION PROVIDED IN PRECEDING OBJECTIVES, OUTLINE COMPLETE SCHEDULE OF WORK FOR THE FARM BUSINESS FOR THE YEAR.

B. INSTRUCTIONAL AREAS

1. PLANNING A LABOR CALENDAR
    - A. DECIDING ON JOBS THAT ARE USUALLY FIXED IN RELATION TO THE TIME THEY MUST BE DONE

B. DECIDING ON JOBS THAT ARE USUALLY SEMI-FIXED IN RELATION TO THE TIME WHEN THEY MUST BE DONE AND CONSIDERING WHEN THEY BECOME FIXED

C. DECIDING ON JOBS THAT ARE USUALLY FLEXIBLE IN RELATION TO THE TIME WHEN THEY MUST BE DONE

2. PLANNING TO MEET THE MAJOR LABOR NEEDS FOR THE YEAR

A. ESTIMATING THE LABOR NEEDED FOR CROP PRODUCTION

(1) ACRES OF CROPS
(2) HOURS PER ACRE

B. ESTIMATING THE LABOR NEEDED FOR LIVESTOCK

(1) KINDS OF LIVESTOCK
(2) UNITS OF PRODUCTION
(3) HOURS PER UNIT

C. ESTIMATING THE OVERHEAD LABOR NEEDED

D. ESTIMATING THE TOTAL LABOR NEEDS FOR THE YEAR AND FOR EACH MONTH OR SEASON

E. COMPARING THE AMOUNT OF LABOR NEEDED WITH THE AMOUNT THAT IS AVAILABLE

3. PLANNING WORK SIMPLIFICATION

A. BREAKING THE JOB INTO PARTS

B. COMPARING THE METHODS AND ACCOMPLISHMENTS WITH THOSE OBTAINED BY OTHERS

C. QUESTIONING THE DETAILS OF THE WORK METHODS

(1) CAN THE JOB BE ELIMINATED
(2) CAN THE JOB BE DONE TO BETTER ADVANTAGE ELSEWHERE
(3) IS THERE A BETTER TIME FOR DOING THE JOB
(4) CAN SOMEONE ELSE DO THE JOB TO BETTER ADVANTAGE
(5) CAN CONDITIONS UNDER WHICH THE JOB IS DONE BE IMPROVED

D. WORKING OUT AN IMPROVED METHOD FOR DOING THE JOB

E. PUTTING THE NEW PLAN INTO USE

4. PLANNING THE LABOR NEEDED FOR A SEASON OF THE YEAR

A. LISTING THE JOBS THAT NEED TO BE DONE

B. CALCULATING THE TOTAL TIME NEEDED FOR EACH JOB

C. ESTIMATING THE TIME THAT WILL BE AVAILABLE FOR DOING EACH JOB

D. COMPARING THE TIME AVAILABLE FOR THE JOBS WITH THE TIME NEEDED TO ACCOMPLISH THEM

E. TAKING INTO ACCOUNT THE NUMBER OF WORKERS AND SETS OF EQUIPMENT THAT WILL BE NEEDED TO ACCOMPLISH VARIOUS JOBS

5. PLANNING COMPLETE WORK SCHEDULES FOR THE FARM

A. CONSIDERING THE ANNUAL AND MONTHLY NEEDS FOR LABOR

B. CONSIDERING JOBS IN RELATION TO WHEN THEY MUST BE DONE

C. PLANNING WORK SIMPLIFICATION WHERE IT IS APPROPRIATE

D. PLANNING TO ACCOMPLISH THE NECESSARY WORK FOR EACH SEASON OF THE YEAR

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE A FARMER SPEAK TO THE CLASS ABOUT ALL THE DIFFERENT JOBS TO BE DONE ON HIS FARM DURING A CERTAIN SEASON AND TELL HOW IMPORTANT HE THINKS IT IS THAT THESE JOBS BE DONE AT A CERTAIN TIME.

2. HAVE STUDENTS MAKE LISTS OF THE ENTERPRISES ON THEIR HOME FARMS, THE JOBS TO BE DONE FOR EACH ENTERPRISE, THE AMOUNT OF TIME FOR EACH JOB, AND THE TOTAL ESTIMATED LABOR NEEDED TO ACCOMPLISH ALL OF THE WORK DONE DURING THE YEAR.

3. HAVE STUDENTS WORK IN PAIRS AND DO TIME AND MOTION STUDIES OF ONE OR MORE FARM JOBS AND WORK OUT A PROCEDURE FOR SIMPLIFYING THESE JOBS, WHILE KEEPING SAFETY AND EFFICIENCY IN MIND.

4. HAVE STUDENTS WORK IN PAIRS AND PLAN COMPLETE LABOR CALENDARS FOR DIFFERENT SEASONS OF THE YEAR; DISTRIBUTE THE ACTIVITIES SO THAT ALL SEASONS ARE INCLUDED BY SOME ONE IN THE CLASS, AND THAT A PARTICULAR FARM SITUATION WILL BE INCLUDED FOR ALL FOUR SEASONS.

5. AFTER COMPLETING ACTIVITY 4, HAVE THE STUDENTS MAKE ANNUAL COMPOSITES OF THE SEASONAL ACTIVITIES TO ILLUSTRATE A PLAN FOR THE YEAR. HAVE THE STUDENTS CHECK THESE PLANS FOR REASONABLENESS REGARDING THE FARM SITUATION THAT IS REPRESENTED.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. HAVE EACH STUDENT CORRECTLY ESTIMATE THE TOTAL NEEDS FOR LABOR FOR THE COMING YEAR ON HIS HOME FARM OR ON THE FARM OF A CLASSMATE OR A NEIGHBOR.

2. EACH STUDENT MUST BE ABLE TO PLAN A DETAILED LABOR CALENDAR OF FIXED, SEMI-FIXED, AND FLEXIBLE JOBS FOR AT LEAST SIX MONTHS OF THE YEAR.

3. EACH STUDENT MUST BE ABLE TO WORK OUT A NEW PLAN FOR DOING A FARM JOB SO THAT IT WILL BE SIMPLIFIED IN TERMS OF TIME REQUIRED AND WORK INVOLVED, WITHOUT THE ADDITION OF COSTLY EQUIPMENT OR THE USE OF UNSAFE PRACTICES.

4. EACH STUDENT MUST BE ABLE TO PLAN THE DETAILED JOBS TO BE DONE IN A THREE-MONTH PERIOD TO THE TEACHER'S SATISFACTION.

5. HAVE EACH STUDENT PLAN A COMPLETE WORK SCHEDULE OF MAJOR JOBS FOR THE HOME FARM OR OTHER FARM FOR ONE YEAR TO THE SATISFACTION OF THE TEACHER.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CHARTS FOR MAKING LABOR CALENDARS
2. STOP WATCHES FOR TIME AND MOTION STUDIES
3. WORK SIMPLIFICATION CHARTS
4. CHARTS FOR RECORDING COMPLETE LABOR PLANS

F. EXAMPLES OF SUPPORTING REFERENCES

1. BALANCING THE LABOR SUPPLY AND THE FARM BUSINESS. VAS 2035. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1963, PP. 1-8.

   THIS MATERIAL FROM AN INSTRUCTIONAL MATERIALS CENTER TELLS ABOUT THE AMOUNT OF LABOR NEEDED FOR VARIOUS FARM ENTERPRISES AND HOW TO MEET THE NEEDS AT THE MOST APPROPRIATE TIMES.

2. HERBST, J.H. FARM MANAGEMENT - PRINCIPLES, BUDGETS, PLANS. CHAMPAIGN, ILLINOIS: STIPES PUBLISHING COMPANY. 1970, PP. 138-159.

   A COLLEGE TEXT THAT WOULD BE USEFUL AS A REFERENCE WHEN CONSIDERING THE PLANNING AND IMPLEMENTATION OF WORK SCHEDULES.

3. SIMPLIFYING WORK IN AN AGRICULTURAL BUSINESS. VAS 6006. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1972, 28 PAGES.

   A REFERENCE UNIT WHICH INCLUDES MATERIAL COVERING DEFINITION OF WORK SIMPLIFICATION PROCEDURE USING CHARTS FOR STUDYING VARIOUS JOBS, ILLUSTRATIONS OF WORK SIMPLIFICATION, AND DISCUSSION OF THE FEASIBILITY OF PURCHASING LABOR SAVING EQUIPMENT.

HUMAN RELATIONS IN PERSONNEL MANAGEMENT

UNIT CONCEPT: A FARM OPERATOR NEEDS TO KNOW HOW TO DEAL WITH THE WORKERS HE EMPLOYS SO AS TO OBTAIN HIGH PRODUCTION AT A REASONABLE COST. THE HUMAN RELATIONS ASPECTS ARE IMPORTANT IN ENABLING FAVORABLE PRODUCTION AND EFFICIENT USE OF LABOR.

A. STUDENT PERFORMANCE OBJECTIVES

THE STUDENT SHOULD BE ABLE TO:

1. GIVEN THE BACKGROUND OF THE EMPLOYEES, EXPLAIN HOW TO COMMUNICATE EFFECTIVELY WITH WORKERS IN REGARDS TO SPEAKING TO THEM, GIVING WRITTEN INSTRUCTIONS TO THEM, AND LISTENING TO THEM TO THE SATISFACTION OF THE INSTRUCTOR.

2. GIVEN THE SITUATION REGARDING TYPES OF JOBS AND WORKING CONDITIONS, DESCRIBE PERSONALITY CHARACTERISTICS AND SUPERVISORY SKILLS WHICH WOULD PROMOTE DESIRABLE EMPLOYER/EMPLOYEE RELATIONS.

3. GIVEN THE SITUATION REGARDING TYPES OF JOBS AND WORKING CONDITIONS, DEVELOP A WRITTEN PLAN OF MANAGEMENT FOR EMPLOYEE WELFARE WHICH MEETS THE REQUIREMENTS OF LABOR LAWS, AND BE AN ECONOMICALLY SOUND WAY OF ACHIEVING WORKER SATISFACTION AND PRODUCTIVITY.

4. GIVEN THE SITUATION REGARDING TYPES OF JOBS AND WORKING CONDITIONS, PLAN A TRAINING PROGRAM FOR EMPLOYEES WHICH USES AN EFFECTIVE EDUCATIONAL METHOD CONSIDERING THE NATURE OF THE WORKERS, EFFICIENT WORK METHODS, AND SAFE PRACTICES WITH MATERIALS AND EQUIPMENT.

B. INSTRUCTIONAL AREAS

1. COMMUNICATING EFFECTIVELY WITH WORKERS

   A. USING EFFECTIVE SPEECH HABITS

      (1) ORGANIZING THOUGHTS
      (2) DEVELOPING A POSITIVE ATTITUDE
      (3) CONVEYING A HELPFUL, FRIENDLY ATTITUDE
      (4) CONCENTRATING ON THE MEANING INTENDED
      (5) MAKING INSTRUCTIONS CLEAR
      (6) REACHING WORKERS WHO HAVE A DIFFERENT NATIVE LANGUAGE

B. LISTENING EFFECTIVELY

- (1) BEING ATTENTIVE
- (2) LISTENING FOR FACTS
- (3) GETTING A CLEAR MEANING
- (4) UNDERSTANDING WORKERS WHO HAVE A DIFFERENT NATIVE LANGUAGE
- (5) WRITING EFFECTIVE NOTES FOLLOWING A CONVERSATION

C. WRITING INSTRUCTIONS EFFECTIVELY

- (1) DECIDING WHEN WRITTEN INSTRUCTIONS ARE DESIRABLE
- (2) WRITING CLEARLY AND CONCISELY
- (3) TAKING INTO ACCOUNT DIFFERENCES IN EMPLOYEE BACKGROUNDS

2. GETTING ALONG WITH EMPLOYEES

A. PRACTICING DESIRABLE PERSONALITY CHARACTERISTICS

- (1) FRIENDLINESS
- (2) OPTIMISM
- (3) HELPFULNESS
- (4) APPRECIATION
- (5) ENTHUSIASM
- (6) TOLERANCE
- (7) FORTHRIGHTNESS
- (8) HONESTY

B. DEVELOPING DESIRABLE CHARACTERISTICS IN SUPERVISORY RELATIONSHIPS

- (1) ESTABLISH REASONABLE GOALS
- (2) PROVIDE LEADERSHIP

    - (A) SETTING GOOD EXAMPLES
    - (B) PROVIDING MOTIVATION
    - (C) INSTILLING CONFIDENCE
    - (D) TAKING RESPONSIBILITY
    - (E) BEING CONSISTENT
    - (F) DEVELOP TEAMWORK
    - (G) BE COOPERATIVE
    - (H) BE A GOOD ORGANIZER

- (3) BE INFORMATIVE

    - (A) PROVIDE CLEAR INSTRUCTIONS
    - (B) PROVIDE CONSTRUCTIVE CRITICISM

- (4) MAKING THE BEST OF UNFAVORABLE SITUATIONS
- (5) UNDERSTAND INDIVIDUAL DIFFERENCES

3. MANAGING EMPLOYEE WELFARE

   A. PROVIDING APPROPRIATE WAGES AND FRINGE BENEFITS

      (1) RENUMERATION CONSISTENT WITH KIND OF WORK
      (2) HEALTH AND ACCIDENT INSURANCE
      (3) SOCIAL SECURITY BENEFITS
      (4) LIVING AND WORKING CONDITIONS
      (5) INCENTIVE PAYMENTS

   B. FOLLOWING APPLICABLE LABOR LAWS

      (1) LAWS RELATING TO WAGES AND HOURS
      (2) LAWS RELATING TO FAIR LABOR PRACTICES IN GENERAL
      (3) LAWS RELATING TO SAFETY
      (4) LAWS RELATING TO MIGRANT WORKERS
      (5) LAWS RELATING TO TAXATION

   C. PREVENTING EXCESSIVE FATIGUE AND WORKER DISCOMFORT

      (1) REASONS FOR FATIGUE
      (2) REST PERIODS
      (3) USE OF STOOLS OR STANDING PLATFORMS
      (4) FAVORABLE TEMPERATURE, LIGHT, HUMIDITY AND VENTILATION
      (5) PREVENTION OF EXCESSIVE NOISE
      (6) USE OF ADEQUATE TOOLS

   D. PROVIDING A SAFE WORK ENVIRONMENT

      (1) WALKING-WORKING SURFACES
      (2) AIR POLLUTION AND RESPIRATORY PROTECTION
      (3) FREEDOM FROM EXCESSIVE NOISE
      (4) EYE AND FACE PROTECTION
      (5) HEAD AND LIMB PROTECTION
      (6) ACCIDENT PREVENTION - MECHANICAL, ELECTRICAL AND OTHER
      (7) WORKERS IN JOBS CLASSED AS "HAZARDOUS"

4. PROVIDING INSERVICE TRAINING OF WORKERS

   A. DEVELOPING A METHOD OF INSTRUCTION

      (1) ORIENTING THE WORKER TO THE NATURE OF THE JOB
      (2) PRESENTING INSTRUCTION OF THE JOB
      (3) HAVING THE WORKER COMPLETE THE TASKS ACCORDING TO THE INSTRUCTIONS
      (4) FOLLOW-UP AND AN EVALUATION OF THE WORKER'S PERFORMANCE
      (5) HAVING WORKERS CORRECT ERRORS MADE IN THEIR TASKS

B. HANDLING DIFFERENT KINDS OF WORKERS

(1) MATURE YOUNG MEN
(2) WOMEN
(3) YOUNG WORKERS
(4) OLDER WORKERS
(5) DIFFERENT ETHNIC BACKGROUNDS

C. INSTRUCTING WORKERS ON JOB SIMPLIFICATION

(1) ANALYZING THE JOB
(2) KEEPING TRAVEL DISTANCES SHORT
(3) USING IMPROVED METHODS

D. TRAINING WORKERS IN USING EQUIPMENT

(1) NONMECHANICAL TOOLS
(2) POWER-OPERATED TOOLS
(3) USE OF FIELD EQUIPMENT
(4) USE OF LIVESTOCK EQUIPMENT

E. MAJOR CONSIDERATIONS IN SAFETY EDUCATION

(1) USE OF PROTECTIVE DEVICES
(2) WORKING WITH HAZARDOUS MATERIALS
(3) ACCIDENT PREVENTION
(4) FIRST AID CONSIDERATIONS
(5) SAFETY IN USING HAND TOOLS
(6) SAFETY IN USING POWER-OPERATED TOOLS
(7) SAFETY IN USING LARGER EQUIPMENT

C. EXAMPLES OF STUDENT LEARNING ACTIVITIES

1. HAVE THE STUDENTS WORK IN PAIRS IN ROLE PLAYING WHERE ONE STUDENT COMMUNICATES INSTRUCTIONS TO THE OTHER STUDENT WHO IS PLAYING THE ROLE OF THE EMPLOYEE.

2. HAVE A FARMER WHO HIRES AT LEAST THREE EMPLOYEES SPEAK TO THE CLASS ON HOW TO GET ALONG WITH EMPLOYEES AND GET EFFICIENCY IN THE USE OF HIRED LABOR.

3. HAVE A FIELDMAN FOR A CANNING COMPANY SPEAK TO THE CLASS ON THE HANDLING OF EMPLOYEE WELFARE.

4. DIVIDE THE CLASS INTO 3 OR 4 GROUPS. HAVE EACH GROUP WORK OUT A TRAINING PROGRAM FOR A WORKER FOR A CERTAIN KIND OF FARM JOB IN THE LOCAL COMMUNITY OR OTHER SITUATION WITH WHICH THE GROUP IS FAMILIAR.

D. EXAMPLES OF PROCESSES TO EVALUATE STUDENT PERFORMANCE

1. THE STUDENT SHOULD CORRECTLY EXPLAIN SIX BASIC PRINCIPLES RELATED TO THE EFFECTIVE COMMUNICATION WITH EMPLOYEES.

2. HAVE EACH STUDENT DEMONSTRATE THROUGH ROLE PLAYING HOW TO EFFECTIVELY GET ALONG WITH EMPLOYEES.

3. HAVE EACH STUDENT CORRECTLY EXPLAIN FOUR MAJOR ASPECTS OF EMPLOYEE WELFARE.

4. THE STUDENT MUST BE ABLE TO WORK OUT AN EMPLOYEE TRAINING PROGRAM THROUGH THE LISTING OF DETAILS OF INSTRUCTION FOR AT LEAST THREE KINDS OF FARM WORK PERFORMED IN HIS COMMUNITY OR OTHER REGION WITH WHICH HE IS FAMILIAR.

E. INSTRUCTIONAL MATERIALS OR EQUIPMENT

1. CHARTS FOR CHECKING INDIVIDUAL PERSONALITY DIFFERENCES

2. CHARTS FOR PLANNING A TRAINING PROGRAM

F. EXAMPLES OF SUPPORTING REFERENCES

1. HUMAN RELATIONS IN AGRICULTURAL BUSINESS. VAS 6003. URBANA, ILLINOIS: VOCATIONAL AGRICULTURE SERVICE, UNIVERSITY OF ILLINOIS. 1971, PP. 3-11.

   THIS MATERIAL FROM AN INSTRUCTIONAL MATERIALS CENTER PROVIDES INFORMATION ON COMMUNICATING PROPERLY, PERSONALITY CHARACTERISTICS AND GETTING ALONG WITH OTHERS.

2. HUMAN RELATIONS IN BUSINESS. COLUMBUS, OHIO: OHIO AGRICULTURAL EDUCATION CURRICULUM MATERIALS SERVICE, THE OHIO STATE UNIVERSITY. 1971, PP. 1-70.

   THIS PUBLICATION FROM AN INSTRUCTIONAL MATERIALS CENTER INCLUDES SUCH AREAS OF STUDY AS THE FOLLOWING: INDIVIDUAL PERSONALITY, RELATIONS WITH FELLOW WORKERS, RELATIONS WITH SUPERVISORS AND ACCEPTING RESPONSIBILITY.

3. KIMBRELL, GRADY AND VINEYARD, BEN S. SUCCEEDING IN THE WORLD OF WORK. BLOOMINGTON, ILLINOIS: MC KNIGHT AND MC KNIGHT PUBLISHING COMPANY. 1970, PP. 67-150, 290-386, 417-454.

   THIS BOOK WAS WRITTEN IN AN EASY-TO-READ MANNER. THE REFERENCE PAGES LISTED DEAL WITH GETTING ALONG WITH OTHER EMPLOYEES, USE OF SOCIAL SECURITY AND INSURANCE, VOCATIONAL TRAINING AND CHILD LABOR LAWS.

4. MAC GILLIVRAY, JOHN H. AND STEVENS, R. J. AGRICULTURAL LABOR AND ITS EFFECTIVENESS. PALO ALTO, CALIFORNIA: THE NATIONAL PRESS. 1965, PP. 1-88.

THIS BOOK PRESENTS INFORMATION ON AGRICULTURAL LABOR IN AN EASY-TO-READ MANNER. IT IS PROBABLY ESPECIALLY HELPFUL TOWARD THE HANDLING OF LARGER FARM WORK CREWS BUT IS ALSO ADAPTABLE TO SITUATIONS WHERE FEWER WORKERS ARE EMPLOYED.

5. FEDERAL REGISTER. VO. 37, NO. 202, PART II. WASHINGTON, D.C.: DEPARTMENT OF LABOR - OCCUPATIONAL SAFETY AND HEALTH STANDARDS, U.S. GOVERNMENT PRINTING SERVICE, OCTOBER 18, 1972.

THIS PUBLICATION OF THE FEDERAL GOVERNMENT ON OCCUPATIONAL SAFETY AND HEALTH STANDARDS CAN PROVIDE IDEAS ON AREAS TO CONSIDER IN PROVIDING A HEALTHFUL AND SAFE ENVIRONMENT FOR FARM WORK AND IN TRAINING FARM WORKERS. MUCH OF THE MATERIAL IS RELATED TO NONFARM WORK, BUT IT SEEMS FAIRLY COMPLETE IN PROVIDING AREAS OF CONCERN.

APPENDIX A

Recommended Materials or Equipment

THIS LIST OF EQUIPMENT CAN BE USED AS A GUIDE IN ORDERING AND ASSEMBLING THOSE ITEMS NEEDED. MANY STATE DEPARTMENTS HAVE MORE DEFINITIVE LISTS AVAILABLE AND IT MAY BE WELL TO REQUEST THESE AS ADDITIONAL SOURCES OF INFORMATION. IN ADDITION, EXPERIENCE CAN BE AN IMPORTANT FACTOR IN DEVELOPING LISTS.

AGRICULTURAL SCIENCE

MICROSCOPES
EGG SCALES
EGG CANDLERS
MILK TESTER WITH SUPPLIES
MASTITIS TEST KIT
BARNES-TYPE DEHORNER
SPOON OR TUBE TYPE DEHORNER
CLIPPER TYPE DEHORNER
ELASTIC DEHORNER
SYRINGES - HEAVY DUTY 20 CC AND 40 CC
GROOMING EQUIPMENT FOR LIVESTOCK
CASTRATING KNIVES AND/OR RAZOR BLADES
SLAUGHTERING EQUIPMENT
LEATHER AND ROPE
ELASTRATOR AND SUPPLIES
EMASCULATOR
SHEEP SHEARING PLATFORM
PIG TEETH NIPPERS
HOG RINGERS
EAR NOTCHERS
SOIL TEST KIT
SOIL AUGER OR TUBE
PRUNING SHEARS
PRUNING SAWS
ROTARY DUSTER
HAND SPRAYERS
TANK SPRAYERS
LIVESTOCK SCALES
ARTIFICIAL INSEMINATION EQUIPMENT
LIVESTOCK MARKING CRAYONS
DISSECTING KITS
CHICKEN INCUBATOR
HEAT LAMPS
EAR TAGS

AGRICULTURAL SCIENCE (CONTINUED)

HOOF TRIMMING NIPPERS AND KNIVES
RAM MARKING HARNESS
BUCKETS OR PAILS
NOSE LEADS WITH ROPE
HOG SNARE
HOT IRON BRANDING TOOLS
TATOO SET
HOSES
WOOL CARDS
PH TEST KIT
LIVESTOCK ELECTRIC CLIPPERS
SHEEP SHEARS - ELECTRIC AND HAND
CALCULATORS OR ADDING MACHINE

AGRICULTURAL MECHANICS

FARM SHOP WORK

PLANER
RADIAL ARM SAW
TILTING ARBOR SAW
DADO HEAD
JOINTER PORTABLE ELECTRIC SAW
DRILL PRESS
PORTABLE ELECTRIC DRILL
BENCH TYPE GRINDERS
POWER HACK SAW
PORTABLE SANDERS
GRINDSTONES
BANDSAW
WOOD LATHE
AIR AND PROPANE TORCH
ANVIL
ANVIL STAND
HARDIES
COLD CUTTER
BLACKSMITH'S SLEDGE
TONGS
MACHINIST'S VISE
DRILL PRESS VISE
ENGINEER'S HAMMER
BLACKSMITHS' HAMMERS
RAWHIDE HAMMER
MACHINISTS RIVETING HAMMER
BALL PEIN HAMMERS
BOLT CUTTERS
CAPE CHISELS
COLD CHISELS
CENTER PUNCHES
HACKSAW FRAMES, ADJUSTABLE

AGRICULTURAL MECHANICS (CONTINUED)

SCREW PLATES (NATIONAL COURSE AND NATIONAL FINE)
COUNTERSINK
PIN PUNCHES
DRIFT PUNCHES
STEEL RULES
BRUSHES-WIRE WHEEL
SCRATCH AWLS
SCREW EXTRACTORS
1/4, 3/8, 1/2" VARIABLE SPEED DRILLS
CALIPERS (OUTSIDE AND INSIDE)
SCREW PITCH GAUGE
GRINDING GOGGLES
PLIERS
VISE-GRIPS
FORGE FURNACE
PUTTY KNIVES
PAINT SCRAPER
GLASS CUTTERS
CIRCULAR GLASS CUTTER
WIRE BRUSHES
PIPE VISES
PIPE CUTTERS
PIPE DIES AND RATCHET
REAMER, BURRING
PIPE WRENCHES
OXY-ACETYLENE TORCH
BENCH GAS FURNACE
SOLDERING COPPERS
SOLDERING COPPER HANDLES
TINNERS' SNIPS
TINNERS' RIVETING HAMMERS
RIVET SETS
TINNERS' MALLETS
SOLERING GUN
ARC WELDERS WITH ACCESSORIES
WELDING HELMETS
COMBINATION WIRE BRUSH AND SCRAPER
CHIPPING HAMMERS
ARC WELDING TABLES
ELECTRODE HOLDERS
WELDING HAND SHIELDS
CARBON ARC TORCH
WELDING CLAMPS
OXYGEN REGULATOR
ACETYLENE REGULATOR
HEAVY DUTY WELDING TORCH
WELDING TIP ASSEMBLIES
CUTTING TORCH

AGRICULTURAL MECHANICS (CONTINUES)

TWIN HOSE FOR OXY-ACETYLENE WELDER
TANK, TORCH AND REGULATOR WRENCHES
FACE SHIELS
GOGGLES (WELDING)
TIP CLEANERS
CYLINDER TRUCK
SPARK LIGHTERS
OXY-ACETYLENE WELDING TABLE
BREAST DRILL
WOOD AUGER BITS
MACHINE WOOD BITS
COUNTER SINKS
PUSH DRILL
BIT EXTENSION
HAND DRILLS
SCREWDRIVER BITS
EXPANSION BITS
BIT STOCK TWIST DRILLS
COUNTER SINKS
WOOD CHISELS
"I-BAR" CLAMPS
HAND SCREWS
C-CLAMPS
MITRE AND CORNER CLAMP
HALF ROUND CABINET FILES
FLET WOOD FILES
EXTRA SLIM TAPER FILES
SLIM TAPER FILES
AUGER BIT FILES
WOOD RASPS
FILE CARDS
ASSORTED FILE HANDLES
WOOD RASPS
NAIL HAMMERS
RIPPING HAMMERS
HATCHET
TACK HAMMERS
COMBINATION SQUARES
STEEL SQUARES
FRAMING SQUARES
TRY SQUARES
SLIDING T-BEVELS
STEEL TAPE (100')
CARPENTERS LEVEL
WING DIVIDERS
TRAMMEL POINTS
STEEL TAPES (POCKET)
YARD STICKS
FOLDING RULES
JACK PLANES
SMOOTHING PLANE

AGRICULTURAL MECHANICS (CONTINUED)

- BLOCK PLANES
- DRAW KNIFE
- CROSSCUT SAWS
- RIP SAWS
- MITRE BOX
- COPING SAW
- BACK SAW
- FILING GUIDE AND CLAMP
- SAW CLAMPS
- SAW GUMMER WHEEL
- SCREWDRIVERS
- PHILIPS SCREWDRIVERS
- OFF-SET SCREWDRIVER
- SAW HORSES
- WOODWORKERS' VISES
- MARKING GAUGE
- WRECKING BARS
- COMBINATION OIL STONES
- SLIP STONES
- GRINDING WHEEL DRESSER
- EXTRA GRINDING WHEEL
- DRESSER CUTTERS
- CABINET SCRAPER
- NAIL SETS
- CARPENTER'S MALLET
- BENCH STOPS
- NAIL PULLER
- SABRE SAW
- WOOD TURNING TOOLS
- PAINT SPRAY OUTFIT
- "POP" RIVETER AND ASSORTMENT OF RIVETS

FARM POWER AND MACHINERY

- AIR COMPRESSOR
- PORTABLE ELECTRIC GRINDER
- ELECTRIC HOIST
- BENCH OILERS
- CANS, SOLVENT STORAGE
- WIRE BRUSH
- SOLID PUNCHES
- LINE-UP PUNCHES
- LINE-UP PUNCH
- WHEEL AND GEAR PULLERS
- TROUBLE LIGHTS
- MIDGET SOCKET SET
- SOCKET WRENCH SET
- BOX END WRENCHES
- COMBINATION WRENCHES

AGRICULTURAL MECHANICS (CONTINUED)

- OPEN END ADJUSTABLE
- SET SCREW WRENCH SET
- TAPPET WRENCHES
- MIDGET IGNITION WRENCHES
- PRESSURE GREASE GUN
- PISTON RING COMPRESSORS
- PLASTIC HAMMER
- THICKNESS GAUGE
- SPEED INDICATOR
- VALVE LIFTERS
- CARBON SCRAPER
- HYDRAULIC FLOOR JACK
- MEHCANICS CREEPER
- DEEP SOCKETS
- HEAVY DUTY SOCKETS WITH HANDLES
- METRIC SOCKET SET
- TORQUE WRENCHES
- BATTERY STRAP
- TUBING FLARING SET
- TUBING CUTTER
- SPARK PLUG GAP WIRE GAUGE
- BATTERY HYDROMETER
- FUNNELS
- COMPRESSION TESTER
- ANTIFREEZE TESTER
- TIRE GAUGE
- PLIERS
- STOCK CARTS
- TOOL KITS FOR SMALL GAS ENGINES
- BATTERY CELL TESTER
- COMBINATION STEAM WASHER AND CLEANER
- TIMING LIGHT
- COIL-CONDENSER-IGNITION TESTER
- PORTABLE DISC SANDER

FARM BUILDINGS AND OTHER STRUCTURES

- BRICK TROWEL
- PLASTERING TROWEL
- POINTING TROWEL
- CONCRETE EDGER
- CONCRETE JOINTER
- CONCRETE FLOATS
- FLUTED RUBBING BRICK
- LONG HANDLED SHOVEL
- SQUARE POINTED SHOVELS
- BRICK HAMMER
- BRICK CHISEL
- MORTAR MIXING BOX
- GRAVEL SCREEN
- BUCKETS

AGRICULTURAL MECHANICS (CONTINUED)

- LEVEL
- MEASURING BOX
- MORTAR MIXING HOE
- STAR DRILLS
- MASONRY DRILL BITS
- PLUMB BOB
- CHALK LINE

FARM ELECTRIFICATION

- LINEMAN'S SIDE CUTTER PLIERS
- LONG NOSE PLIERS
- DIAGONAL CUTTING PLIERS
- AMERICAN STANDARD WIRE GAUGE
- ELECTRICIAN'S SCREWDRIVERS
- AMMETER
- VOLTMETER
- WATT HOUR METER
- CIRCUIT TESTERS
- ELECTRICIAN'S BITS
- CABLE STRIPPERS
- WIRE CUTTER AND CRIMPERS
- ELECTRIC SOLDERING IRON
- ELECTRIC SOLDERING IRON

SOIL AND WATER MANAGEMENT

- CONVERTIBLE LEVEL AND TRANSIT
- ROD AND TARGET
- HAND LEVELS
- MARKING PINS
- ABNEY LEVEL

APPENDIX B

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APPENDIX C

SELECTED LIST OF PROFESSIONAL AND TECHNICAL SOCIETIES AND ORGANIZATIONS CONCERNED WITH AGRICULTURAL PRODUCTION AND ITS APPLICATION

INCLUSION OR OMISSION OF AN ORGANIZATION OR SOCIETY IN THIS LIST DOES NOT IMPLY APPROVAL OR DISAPPROVAL OF IT. ADDITIONAL INFORMATION REGARDING LOCAL CHAPTERS OR SECTIONS OF THESE ORGANIZATIONS OR SOCIETIES MAY BE OBTAINED BY WRITING DIRECTLY TO THE EXECUTIVE SECRETARY AT THE LISTED ADDRESS.

AMERICAN AGRICULTURAL ECONOMIC ASSOCIATION, C/O C.D. KEARL,
WARREN HALL, CORNELL UNIVERSITY, ITHACA, NEW YORK 14850

AMERICAN DAIRY SCIENCE ASSOCIATION, 903 FAIRVIEW AVENUE,
URBANA ILLINOIS 61801

AMERICAN FORAGE AND GRASSLAND COUNCIL, P.O. BOX 48, STATE
COLLEGE, PENNSYLVANIA 16801

AMERICAN POULTRY ASSOCIATION, P.O. BOX 337, GREAT FALLS,
MONTANA 68333

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS, 1950 NILES
AVENUE, ST. JOSEPH, MICHIGAN 49085

AMERICAN SOCIETY OF AGRONOMY, 677 SOUTH SEGOE ROAD, MADISON,
WISCONSIN 53711

AMERICAN SOCIETY OF ANIMAL SCIENCE, C/O Q CORPORATION,
39 SHERIDAN AVENUE, ALBANY, NEW YORK 12210

AMERICAN SOCIETY OF FARM MANAGERS AND RURAL APPRAISERS,
P.O. BOX 295, DEKALB, ILLINOIS 60115

AMERICAN SOCIETY OF RANGE MANAGEMENT, 2120 SOUTH BIRCH
STREET, DENVER, COLORADO 80222

BIO-DYNAMIC FARMING AND GARDENING ASSOCIATION, ROUTE 1,
STROUDSBURG, PENNSYLVANIA 18360

CROP SCIENCE SOCIETY OF AMERICA, 677 SOUTH SEGOE ROAD,
MADISON, WISCONSIN 53711

FARMLAND INDUSTRIES, 3315 NORTH OAK TRAFFIC WAY, KANSAS
CITY, MISSOURI 64116

FORESTRY, CONSERVATION COMMUNICATIONS ASSOCIATION,
C/O WILLIAM F. SANDERS, OREGON DEPARTMENT OF NATURAL
RESOURCES, 2600 STATE STREET, P.O. BOX 2289, SALEM,
OREGON 97310

NATIONAL ASSOCIATION OF ANIMAL BREEDERS, 512 CHERRY STREET,
P.O. BOX 1033, COLUMBIA, MISSOURI 65201

NATIONAL ASSOCIATION COUNTY AGRICULTURAL AGENTS, 600 SOUTH
FREDERICK AVENUE, GAITHERSBURG, MARYLAND 20760

NATIONAL ASSOCIATION GREENHOUSE VEGETABLE GROWERS, 19120
DETROIT ROAD, CLEVELAND, OHIO 44116

NATIONAL ASSOCIATION OF STATE DEPARTMENTS OF AGRICULTURE,
1522 K STREET, N.W., SUITE 736, WASHINGTON, D.C. 20005

NATIONAL AUBUBON SOCIETY, 1130 FIFTH AVENUE, NEW YORK,
NEW YORK 10028

NATIONAL CHRISTMAS TREE GROWERS ASSOCIATION, 225 EAST
MICHIGAN STREET, MILWAUKEE, WISCONSIN 53202

NATIONAL CORN GROWERS ASSOCIATION, P.O. BOX 358, BOONE,
IOWA 50036

NATIONAL LIVESTOCK PRODUCERS ASSOCIATION, 155 NORTH WACKER
DRIVE, CHICAGO, ILLINOIS 60606

NATIONAL WILDLIFE FEDERATION, 1412 16TH STREET, N.W.,
WASHINGTON, D.C. 20036

POULTRY SCIENCE ASSOCIATION, TEXAS A & M UNIVERSITY,
COLLEGE STATION, TEXAS 77843

SOIL SCIENCE SOCIETY OF AMERICA, 677 SOUTH SEGOE ROAD,
MADISON, WISCONSIN 53711

WEED SCIENCE SOCIETY OF AMERICA, AGRONOMY DEPARTMENT,
UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS 61801

WILDERNESS SOCIETY, 729 15TH STREET, N.W., WASHINGTON, D.C.,
20005

WILDLIFE SOCIETY, 3900 WISCONSIN AVENUE, SUITE S-176, WASHINGTON, D.C. 20016

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